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THE BEGINNINGS OF TEOTIHUACÁN*

RENÉ MILLON

ABSTRACT

The problem of the age of the pyramids of the Sun and Moon at Teotihuacán is considered in the light of evidence from an extensive and hitherto unreported Tzacualli or Teotihuacán I occupation to the northwest of the Pyramid of the Moon. Material from a small excavation in this new zone is commented upon briefly. Previous analyses of the age of the pyramids are discussed in the context of the new evidence, the conclusion being that the Pyramid of the Sun and probably also the Pyramid of the Moon were built in the earliest phase of the occupation of Teotihuacán rather than later as commonly assumed. The relationships of the Tzacualli phase to other sites in the Valley of Mexico are discussed and it is concluded that the pyramids were probably built in about the last century before Christ or earlier. Since the building of these enormous pyramids implies a relatively complex level of social integration, this new level must have come into being some several hundred years or more before the building of the pyramids unless a large-scale migration was involved. For this it is contended there is no good evidence. Linné's new chronological placement of Tlamimilolpa before Xolalpan rather than after is discussed. Comments are made on the significance of this reversal of chronology for the growth of the city and for the expansion of its "influence" to other parts of Mesoamerica.

TEOTIHUACAN was one of the greatest "Classic" centers in ancient Mesoamerica — architecturally, artistically and in terms of the sheer size of the city itself and of some of the buildings in it. Traces of its "influence" are found widely in Mexico and Central America. Much of the relative chronology for the "Classic" in Mesoamerica rests on cross-ties of Teotihuacán with various parts of Mesoamerica, principally on the basis of pottery but also on the basis of other artistic and architectural evidence. The problem of how this "influence" is to be interpreted in various parts of Mexico and Guatemala is one of the central problems in Mesoamerican prehistory, one for which we have no satisfactory answer yet. For these and other reasons Teotihuacán has to occupy a central position in any general discussion of the florescence of civilization in Mesoamerica during the so-called Classic period. Because of this the problem of the beginnings of Teotihuacán assumes a special signficance.

The purpose of this paper is to discuss one aspect of the problem of the beginnings of Teotihuacán — the problem of when the construction of monumental architecture began at the site. This is an important question in itself, but is also a matter of general interest because of the social implications of constructions of enormous size at Teotihuacán. The earliest evidence of human occupation on a significant scale so far found within the zone of Teotihuacán is an assemblage of artifacts known generally as Teotihuacán I or as Tzacualli in the Armillas (1950) classification. The most distinctive aspect of this assemblage is a polychrome pottery, often involving resist or "negative" decoration. This particular type of polychrome pottery is absent in the later phases of occupation at Teotihuacán.

The problem I am concerned with can be formulated simply: Were the first really big buildings at Teotihuacán built by the people who made the pottery of the Tzacualli phase? This question is of more than special interest both because of the apparently early chronological position of the Tzacualli or Teotihuacán I materials and because of the great size of the structures involved — the pyramids of the Sun and Moon. These pyramids provide us with the first unmistakable evidence we have in the Valley of Mexico for an elaborately stratified society with marked specialization of function.

* Since this paper was written, more extensive investigations of the Oztoyahualco zone have been made. A number of mounds and exposed structures in the zone have been mapped and further excavations were carried out in the South Platform of Plaza 1. The northwest corner of the city has been located and more is now known about the extent and nature of the occupation of this zone than is indicated in this paper. A major extension of the city to the southeast was also discovered. In addition, investigations were carried on in the tunnels within the Pyramid of the Sun which have added to our knowledge concerning this structure. Analysis of this material has not yet been completed.

To put it another way, the building of these pyramids unequivocally marks the beginning of civilization in the Valley of Mexico. Cuicuilco and Tlatilco may represent other such developments when we know more about them but the evidence at Teotihuacán is unequivocal.

Pottery of the Tzacualli phase has been found within the Pyramid of the Sun completely unmixed with later materials and the same is claimed of material from the interior of the Pyramid of the Moon (Noguera 1935: 6; Pérez 1935: 91–2; Vaillant 1938: 540–1, 561; Tolstoy 1958: 57). The Pyramid of the Sun is the largest structure ever built at Teotihuacán. About 700 by 700 feet at its base and a little over 200 feet high, it is one of the largest structures in Mexico. The interior of the pyramid is of earth, more than a million cubic yards of it. Its exterior was faced with stone and covered with plaster. It was apparently built as a single building operation, that is, there does not appear to be any evidence of any major structures within its interior (Pérez 1935: 92). The Pyramid of the Moon is a much smaller structure — 500 by 400 feet at the base, about 100 feet high, with a volume of about 250,000 cubic yards. Whether the major part of it was built in a single building operation is not known since extensive excavations have never been carried out in it.

Normally, the fact that these two great structures seem to contain only materials of the Tzacualli phase within them would be sufficient evidence to place their construction in that phase. Nevertheless, archaeologists working at Teotihuacán have been reluctant to place the great pyramids in the Tzacualli phase. Noguera (1935: 75–7, 95), who analyzed the 35,000 potsherds and other material found in the west tunnel which penetrated to the center of the Pyramid of the Sun, believed that the Tzacualli materials represented the remains of an occupation by a people strongly influenced by west Mexican traditions who lived at Teotihuacán before the building of the pyramid. Vaillant (1938: 540–2, 560–1), who dug in the Pyramid of the Moon, reached substantially the same conclusion (also Armillas 1944: 134). Linné (1942: 182–3) concluded that the gap in pottery style between Tzacualli and later phases was so great as to suggest population displacement. Armillas (1944: 132–3; 1950: 67–8) viewed the situation somewhat differently. He saw no reason to postulate a discontinuity between Tzacualli and later phases, but was still reluctant to place the construction of the pyramids unequivocally in the first phase. Instead he places the construction of the pyramids at the very beginning of the Miccaotli or Teotihuacán II phase. As he puts it: "*Tzacualli* — . . . Before all the buildings known at Teotihuacán; the end of this phase is marked by the beginnings of urbanization in this area with the construction of the pyramids of the Sun and Moon."

Thus, four of the archaeologists most familiar with Teotihuacán and with its pottery have been unwilling to place the building of the pyramids completely within the earliest phase of occupation at Teotihuacán. Gamio (1922, Vol. 1: 179–82) did postulate a continuity between what we now call Tzacualli figurines and later Teotihuacán figurines, but, like most later investigators, he did not postulate an internal development from one to the other. Instead he assumed that a new population arrived and joined the earlier occupants of the site before any major buildings were erected.

Kidder, Jennings, and Shook (1946: 252) have commented on this curious matter of the chronological placement of the pyramids as follows:

> In our opinion . . . these specimens [from the Pyramid of the Sun] much more probably exemplify the types contemporaneous with, or at least only very little older than, the pyramid itself, because although ancient materials are almost always present in later constructions . . . it is to us inconceivable that no sherds of wares currently in use could fail to have found their way into the hearting of any large Mesoamerican structure and, in this case, not have been included in so large a sample as that studied by Noguera.

Other archaeologists have reached conclusions similar to those of Kidder, Jennings, and Shook in recent years, among them Wauchope (1950: 243), Marquina (1951: 69), Brainerd (1954: 18–19), Piña Chán (1955: 67), and Tolstoy (1958: 71). Still others have accepted the placement of the pyramids in the "Classic" (Willey and Phillips 1958: 186). In the meantime Shook and Kidder (1952: 123) have restated their position more conservatively: "We are not entirely convinced . . . that the great Pyramid of the Sun at Teotihuacan was a Classic structure." Except for Marquina and Tolstoy these men were not directly and intimately concerned with the internal development of Teotihuacán itself. It seems to me that the problem is difficult to understand unless

this is realized. It is not merely, as Kidder, Jennings, and Shook (1946: 252) intimate, that Noguera (and others) were reluctant to place the construction of these pyramids in the "Preclassic," although this was undoubtedly part of the problem. There was another reason which stems from the curious distribution of Tzacualli materials at Teotihuacán. With one possible exception, the pyramids of the Sun and Moon were the only structures at Teotihuacán which yielded Tzacualli materials unmixed with material of later phases (Tolstoy 1958: 57, 85). Furthermore, if you walk over the mounds, streets, and plazas of the ancient city east, west, and south of the Pyramid of the Moon, you will be struck by the almost total absence of pottery from this phase on the surface. For example, in Tolstoy's 1953–54 surface survey of the central part of the city he found pottery of the Tzacualli or Teotihuacán I phase only in the vicinity of the Pyramid of the Moon (Tolstoy 1958: 57, 73).

In other words, no real zone of occupation in the form of *undisturbed* deposits dating from the Tzacualli phase seemed to exist at Teotihuacán (Vaillant 1938: 541). This is not true of the somewhat comparable situation at Kaminaljuyu where Miraflores deposits are abundant and deep (Kidder, Jennings, and Shook 1946: 241; Shook and Kidder 1952: 122–3). Instead what we had at Teotihuacán were a few mixed deposits in the fill of structures along and near the central and northern parts of the Street of the Dead, plus the apparently pure deposits in the fill of the great pyramids. Why should this be? One possible explanation is that there was no intensive occupation of the Teotihuacán zone by peoples making Tzacualli pottery, and therefore no occupation of sufficient magnitude to make possible the construction of such tremendous buildings as the pyramids of the Sun and Moon. This, it seems to me, is one of the principal reasons why Noguera, Vaillant, Linné, and to a lesser extent, Armillas interpreted the evidence as they did (for example, Vaillant 1938: 541). Of course, this meant in effect that, Armillas excepted, the origins of civilization at Teotihuacán were being sought outside the Valley of Teotihuacán and even the Valley of Mexico, because if the building of the pyramids is placed at the beginning of the Miccaotli or Teotihuacán II phase this still leaves no room for developmental beginnings since the Tzacualli materials were not thought to represent the remains of a truly large scale occupation.

There is no doubt that the distribution of Tzacualli materials at Teotihuacán was anomalous. The material for the fill of the pyramids and other structures containing Tzacualli pottery must either have come from middens or from still earlier structures. If so, some of these middens or earlier structures should still exist. It would be truly extraordinary if all of them had been razed and carried off for the building of the pyramids and later structures. Some of them should have survived. The most logical place to look was the region to the north of the Pyramid of the Moon since surface deposits of Tzacualli pottery had been found near the pyramid and only rarely to the east, west, and south of it. The northern boundary of the city was thought to have been only a short distance north of the Pyramid of the Moon and the region beyond was not thought to have had any significant bearing on the ancient city (Armillas 1950: 59). It is in this context that James Bennyhoff and I carried on a reconnaissance in 1957 in the Oztoyahualco region to the north and northwest of the Pyramid of the Moon. One of the things we hoped to find was refuse deposits of the Tzacualli phase. What we actually found was a major extension of the building zone of Teotihuacán itself. This was unexpected, mainly because we could not suspect that such a major building zone could have gone unnoticed or unappreciated. We found scores of mounds, none of great size, in a broad arc about a mile long to the northwest and west of the Pyramid of the Moon (Fig. 1). Some of these mounds are arranged in plazas, several of which are of great size. A preliminary report on the results of that reconnaissance has been published as well as the results of a small exploratory excavation carried out at the same time (Millon 1957; also Cook de Leonard 1952: 49; 1957; Noguera and Leonard 1957). Here I want only to comment on how this new evidence bears on the general problem of the beginnings of Teotihuacán.

We found a number of surface concentrations of Tzacualli pottery in the Oztoyahualco region in a zone of variable width extending for about a kilometer. Within this zone we found a small plaza which I have called Plaza 1 (Fig. 1). It consists of three small mounds facing a plaza with a low platform on the fourth or southern side (Fig. 2). Three-fourths of the pottery

Fig. 1. Aerial view of part of the city of Teotihuacán. *a*, Pyramid of the Moon; *b*, Pyramid of the Sun; *c*, Ciudadela; *d*, Viking Group; *e*, Xolalpan; *f*, Tlamimilolpa. The Oztoyahualco zone is west and northwest of the Pyramid of the Moon and extends to the top of the photograph. Plaza 1 in the Oztoyahualco zone is immediately above *g*. Plaza 1 is 800 m. from the northwest corner of the Pyramid of the Moon. Courtesy Compañía Mexicana Aerofoto, S.A.

found on the surface of Plaza 1 is of the Tzacualli phase. A small test pit sunk into the south platform disclosed a series of earth floors containing pottery exclusively of the Tzacualli phase plus two caches of broken Tzacualli pottery.

More intensive survey and more extensive excavations are still needed, but preliminary study of the material so far collected indicates the following:

1. There is a broad zone of Tzacualli occupation in the Oztoyahualco region including undisturbed objects of Tzacualli manufacture, that is, Tzacualli objects in their original position, not incorporated into the fill of structures (Plaza 1 caches).

2. Simple structures with earth floors were built during the Tzacualli phase at Oztoyahualco. Judging from the evidence provided by partially exposed and looted structures, more

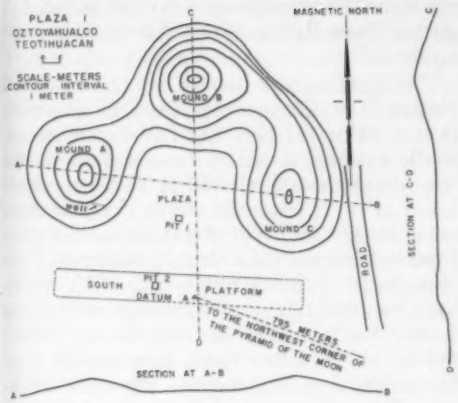

FIG. 2. Plaza 1, Oztoyahualco, Teotihuacán. The form of the South Platform is idealized. From a map by Eduardo Contreras.

elaborate but still relatively small structures of stone of this phase also exist in the region.

3. The pottery of the Tzacualli phase is definitely related to the pottery of the later Teotihuacán phases (also Noguera 1935: 77, 95; Armillas 1944: 132–3; Tolstoy 1958: 57, 65–7). These relationships are principally relationships of form and include a relatively high frequency of flat unpolished bases as well as a cylindrical form quite similar to the nubbin-legged one found by Linné (1956: 187–9, Fig. 10) in the "incineration tomb" at Tlamimilolpa except that it is without supports of any kind (Fig. 3). Linné has recently commented on the tripod vessels from this tomb and now feels that the Tlamimilolpa ruin (the largest complex of rooms yet found at Teotihuacán) must be *earlier* than Xolalpan or Teotihuacán III rather than later. The Tlamimilolpa tripods do not seem to be derived directly from the Plaza 1 cylindrical vessel at Oztoyahualco, but they are so similar in form (especially Linné 1956, Fig. 10) that a connection seems indicated. Linné's re-assessment of the chronological position of Tlamimilolpa makes such a connection more understandable.

4. The design on the Plaza 1 cylindrical vessel is complicated. It is not in Classic Teotihuacán style but possibly indicates that in this early phase a distinctive, developed art style already existed at Teotihuacán. The complexity of the design may be appreciated by examining the "unfolded" painting of it reproduced here as Figure 4. The design may be a representation of an animal's face or part of it (the "earth monster"?). The undulating motif which dominates the vessel conceivably could be a representation of feathers. However, in the absence of comparative material or other clear evidence to serve as a guide to the meaning of these elements such speculation on my part can have little meaning since it is always possible that the design is purely decorative. One effect of its publication may be that others will be able to do more with it than I have.

5. The Teotihuacán Water God (the so-called Tlaloc) may also have had his beginnings in the Tzacualli phase. A Tzacualli figurine head from the Plaza 1 excavation bears what may be the "spectacle" eyes so characteristic of the later Water God but it lacks the typical treatment of the mouth (Fig. 5 *d*). See also Medellín Zenil (1953, Fig. 38) for a "Tlaloc" prototype from Remojadas.

6. The shell and the shell trumpet, so important in later Teotihuacán times, was apparently also important in the Tzacualli phase since a figurine fragment from one of the caches in the Plaza 1 dig seems to represent a shell trumpet held by two hands (Fig. 5 *e*).

FIG. 3. Repaired cylindrical pottery vessel from Cache 1, Test Pit 2, Plaza 1, Oztoyahualco. Height of vessel, 16 cm.; Diameter at base, 13 cm. See also Figure 4.

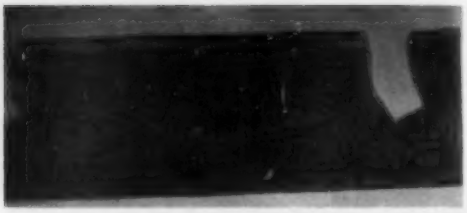

Fig. 4. Unrolled design of cylindrical vessel shown in Figure 3. Colors: Black and red on yellow-brown. Basic black design was formed by resist technique ("negative painting"). The base color is largely covered by the red but shows through sporadically, giving the impression that the red was carelessly and incompletely applied.

On the basis of this we may conclude the following:

1. There is a major zone of Tzacualli occupation at Teotihuacán, a large part of which may be undisturbed.

2. This zone includes simple structures of earth and probably more elaborate structures as well.

3. The Tzacualli assemblage is developmentally an integral part of the Teotihuacán sequence.

4. The Pyramid of the Sun must have been built in the Tzacualli phase, and probably also the Pyramid of the Moon. This means that the Tzacualli phase must have occupied a long period of time unless we assume actual migrations into Teotihuacán of people at a relatively advanced level of social development. For this there is at present no real evidence. Furthermore, now that we know there was a major zone of Tzacualli occupation at Teotihuacán, there is no reason to postulate such migrations until we know more about the nature and extent of the Tzacualli phase at Teotihuacán itself. We must distinguish between technological and stylistic diffusion — which undoubtedly occurred — and the "spread" of new forms of social and economic organization — which may or may not have occurred. The two processes are obviously not the same and it requires much more evidence to establish the latter than the former. The close relationship between Teotihuacán and the great site of Remojadas in central Veracruz should be noted here (Medellín Zenil 1953: 371–6; 1955: 102–4; García Payon 1953: 385–7). José Luis Franco first called to my attention the strength of this relationship, the nature of which remains to be determined. In my opinion the evidence does not warrant any conclusion that an actual migration from Remojadas to Teotihuacán was involved.

The significance of Linné's new chronological placement of Tlamimilolpa deserves comment (Linné 1956: 181, 186–8). Linné's argument, briefly mentioned above, centers around the "incineration tomb" (Burial 1) and the vessels found in it. It impresses me as a logical one. Linné (1942: 186) had previously argued that Tlamimilolpa was later than Xolalpan or Teotihuacán III. Armillas (1944: 132; 1950: 68–9) had concurred in this view, though with some doubt. Kidder, Jennings, and Shook (1946: 253–4), on the other hand, have argued that Tlamimilolpa seemed slightly older than Xolalpan. They also suggested that some of the tripods in the "incineration tomb" might represent prototypes of the Teotihuacán cylindrical tripods (Kidder, Jennings, and Shook 1946: 171).

Fig. 5. Figurine fragments from Test Pit 2, Plaza 1, Oztoyahualco. *a–c*, standard Tzacualli figurine heads (compare illustrations in Noguera 1935); *d–f*, unusual specimens. Height of *f*, 4 cm.

It is worthy of note that Linné (1956: 190–1) has recently obtained a radiocarbon date for Tlamimilolpa from charcoal from the "incineration tomb." The date is A.D. 235±65 (S–162). If Tlamimilolpa is later than Xolalpan, this would be an impossibly early date, even under the Spinden correlation. But if, as Linné now argues, Tlamimilolpa is earlier, the new date would be within reason.

Linné (1942: 114–5; 1956: 181) believes that the Tlamimilolpa room complex (comprising at least 175 rooms, courts and alleys) was occupied for a relatively short period of time, probably no more than 150 years and perhaps less. With this in mind it seems to me that the distinctive ceramic elements at Tlamimilolpa may represent a period of very short duration at Tlamimilolpa and that the room complex itself continued to be occupied for some time after the beginning of the Xolalpan phase. This appears to me to be a reasonable interpretation of the ceramic evidence since, except for the "incineration tomb," the differences between the Xolalpan and Tlamimilolpa materials is not great (compare Linné 1934: 51–74, 91–105; 1942: 124–44, 161–79; Armillas 1944: 127–33). Of course it is also possible that the differences in pottery which do exist are the product of social rather than chronological differences. The principal reasons Tlamimilolpa appears to me to have been occupied somewhat earlier than the Xolalpan ruin are the following:

1. Presence of distinctively incised cylindrical tripods with nubbin supports in the "incineration tomb" at Tlamimilolpa, mentioned above. One slab-footed tripod was also found in this tomb, presumably undecorated (Linné 1942: 127).

2. Relatively high frequency at Tlamimilolpa of flat-bottomed bowls with flaring sides, sometimes with, sometimes without nubbin supports. This form was characteristic of the Miccaotli phase (Teotihuacán II) in the Viking Group excavations of Armillas (1944: 128; Pl. 1, Fig. 4). While also found at Xolalpan it seems to have been more abundant at Tlamimilolpa (compare Linné 1942: Figs. 203, 217, 130, 133–38, 140, 142–43 (?); 1934, Figs. 50, 53, 72–3; see also comment of Kidder, Jennings and Shook 1946: 254).

3. Predominance of pottery incised before firing at Tlamimilolpa as opposed to predominance of pottery scraped after firing at Xolalpan (Linné 1942: 164, 186; Armillas 1944: 130, 132; 1950: 68–9).

4. Relative rarity of painted pottery at Tlamimilolpa as compared with Xolalpan (Linné 1942: 186).

The importance of the new placement of Tlamimilolpa should be apparent. This enormous complex is located on what is now thought to be the eastern margin of the city (Fig. 1 *f*). This suggests that the city covered an area of at least several square miles before the beginning of the Xolalpan phase. Xolalpan is the phase usually associated with the maximum expansion of the "influence" of Teotihuacán and the Tlamimilolpa complex has been thought of as marking the maximum expansion of Teotihuacán to the east towards the end of the life of the city (Armillas 1950: 68–9). If the new chronological position of Tlamimilolpa is correct, Teotihuacán must have been a city of tremendous size considerably earlier than previously suspected, and prior to the great expansion of its "influence" (for example, Sanders 1956: 124).

This leads to another point. For reasons which cannot be explored here it will probably be necessary to split the Tzacualli or Teotihuacán I phase into two or more phases when more work is done in the Oztoyahualco region. This, plus the new placement of Tlamimilolpa, demonstrates more than ever the need for phase names rather than numbers for the developmental sequence at Teotihuacán. Kidder, Jennings, and Shook (1946: 254) pointed out the need for this and Armillas (1950: 67–9) proposed appropriate phase names. These have not yet been generally accepted, but it seems to me that they will now have to be or soon we shall no longer be able to communicate with each other. If, for example, we can establish an occupation phase at Oztoyahualco which is significantly earlier than that of the builders of the Pyramid of the Sun, it would be a simple matter to name this Oztoyahualco and to place it before Armillas' Tzacualli phase. In the numbered system we could call it Teotihuacán I–A or Proto-Teotihuacán I. But if anything earlier turned up which was still part of the Teotihuacán sequence, then what? Furthermore, as Kidder and his colleagues have pointed out, by using phase names we avoid the possibility of imputing continuity which might later turn out to be illusory. And it need not be em-

phasized that we still know remarkably little about the internal chronology of Teotihuacán considering the amount of work so far accomplished. Tolstoy's recent study (1958) is a long step in the right direction, but much more work is still needed.

Before we can hope to solve many of the problems connected with the rise and expansion of Teotihuacán we shall have to arrive at the definition of chronological periods of short duration, of the order of 50–100 years or better. Chronological precision of this order is now being developed by John H. Rowe and his associates for the south coast of Peru. Precision of this order is also emerging from the study of the ceramics of Uaxactún. So far it has not emerged from studies at Teotihuacán. Yet Teotihuacán is an especially important site for the establishment of firm inter-regional chronologies because of its ties with so many other regions of Mesoamerica. The situation created by the new chronological placement of Tlamimilolpa is an indication of how much we still need to know before we can firmly establish the major outlines of the Teotihuacán sequence. This has to be done before we can begin to refine it into shorter and shorter periods.

To return to the Tzacualli problem, what is the chronological status of the Tzacualli phase? Tolstoy (1958: 56–7, 65–6, 71) has recently summarized the evidence bearing on this problem (also Porter 1956: 571–4 and Piña Chán 1958: 114–9). It is clear that the Tzacualli phase was in part contemporaneous with late Ticomán and Cuicuilco in the Valley of Mexico and it has been assumed that it is at least partially derivative from them (for example, Armillas 1950: 67). Tolstoy (1958: 71, 65–6) suggests that "two cultural streams or traditions" may have existed in the Valley of Mexico at the same time — the Cuicuilco-Ticomán tradition in the southwest and the Teotihuacán I or Tzacualli tradition in the northeast — and he cites evidence in support of his views. His evidence is suggestive as is the fact that Tzacualli pots are characterized by an almost complete absence of vessel supports. The latter would imply a relationship to the earlier Middle Zacatenco phase rather than to Ticomán which is characterized by a wide variety of supports. This would tend to suggest that the Tzacualli phase was fully contemporaneous with Ticomán and Cuicuilco. Another indication of this is the fact that one of the sherds Vaillant illustrates from Ticomán (Vaillant 1931: 386, Pl. 76 *i*) is a Tzacualli sherd (in form, decoration, and temper). Its form is not correctly illustrated and examination of it (through the courtesy of Gordon Ekholm of the American Museum of Natural History) revealed that it is almost identical in form to the cylindrical vessel from Oztoyahualco discussed above (Fig. 3). Vaillant speaks of a "faint design possibly made by lost color" on the sherd and examination of the specimen confirmed that part of its design was formed by the resist technique characteristic of much of Tzacualli pottery. The sherd was found in deposits of the Early Ticomán phase (Vaillant 1931: 237–8, Tables I, II). An isolated sherd of this kind may mean almost anything. Nevertheless, it is of potential significance, perhaps of more significance than the evidence which Vaillant cites in support of the contemporaneity of Ticomán and Teotihuacán (Vaillant 1931: 339).

There are, however, other complicating factors which have to be taken into consideration. The 1957 excavations at Cuicuilco yielded small amounts of Tzacualli pottery but for the most part this was confined to the upper levels, that is, to the latter part of the occupation of Cuicuilco (Heizer and Bennyhoff 1958; Bennyhoff, personal communication). Of even more significance is evidence from Cuanalan, a site in the southern part of the Valley of Teotihuacán itself, only 7 miles southwest of the Pyramid of the Sun. Bennyhoff and I collected pottery and figurines from Cuanalan in 1957, and examination of this material reveals a clear relationship to the pottery of Ticomán and Cuicuilco — both in form and manner of decoration — and to the figurines of Chupícuaro to the northwest in Guanajuato (Porter 1956: 571–2). Resist or "negative" decoration, on the other hand, is rare and the material does not otherwise reveal close relationships to Tzacualli pottery and figurines. Thus, pending further evidence, it would appear that the Tzacualli phase, while contemporaneous with Ticomán and Cuicuilco, was contemporaneous only with the later parts of the sequences at these sites.

If so, where would this place the building of the great pyramids? Probably in the last century or so before the time of Christ, rather earlier than later. The new level of social integration which these pyramids imply would of necessity have had its beginnings some hundreds of years earlier, again assuming no wholesale migration

was involved. Where this would place Teotihuacán in relation to other early highland and lowland civilizations in Mesoamerica is still an open question. We are still far from understanding either the social and cultural basis for the early development of Teotihuacán into a great urban center or its relationships with other early centers of civilization in Mesoamerica.

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AN UNUSUAL PUEBLO III RUIN, MESA VERDE, COLORADO

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ABSTRACT

Site 52, a possible platform mound, is unusually situated near the bottom of a draw rather than along the ridge of Chapin Mesa. Complete excavation of the small surface structure yielded two distinct levels of construction and several architectural phenomena which previously had not been reported from San Juan Anasazi sites. A rectangle of multiple-coursed masonry was built on a sloped, irregular ground surface. An interior crosswall with a floor level opening, a raised circular floor feature, two peripheral stepped abutments on opposite sides, and a complex of masonry walls and external alignments on the third side were added to the basic rectangle. The second construction level utilized what appeared to be intentional interior and exterior fill as a base, and two alignments further subdivided the rectangle. Two rubble-filled abutments were appended externally to the fourth wall of the rectangle. Artifacts were rarely found. Solid, continuously built coursed masonry, construction techniques, and pottery types suggest that Site 52 was built during Pueblo III and may have been a platform mound of ceremonial significance.

DURING THE SUMMER of 1955, several unusual architectural features namely, step forms, multiple abutments, numerous alignments, and a peculiar floor feature, all involving stone construction, were uncovered in a small Pueblo III ruin, Site 52, located in Mesa Verde National Park in southwestern Colorado. Previously, similar features in such combination had not been reported from other San Juan Anasazi sites. The small mesa-top ruin, first identified by a rectangular outline of multiple-coursed masonry appearing on the surface but unaccompanied either by a kiva depression or by a trash mound, was completely excavated.

Site 52 lies on the east side of the main ridge of Chapin Mesa, about ½ mile northwest of Sun Temple, 1 mile southeast of Park Headquarters, and just southwest of the road connecting the two. The ruin is situated near the bottom of a slight draw at an elevation of 6896 feet. Ultimately the draw, once heavily eroded and later filled by sedimentation, drains into Fewkes Canyon. Such a location is not congruous with other nearby sites which are usually found along the ridges of the mesa. The builders must have been aware of the flooding of the draw under rainy conditions. Following several heavy summer rains in 1955, runoff so threatened the lower side of the the site, and water so saturated the soil that excavation was temporarily halted. Apparently the original drainage pattern in the immediate area of the site was not disturbed by recent road construction on the northeast side of the draw.

Prior to excavation, the ruin formed a low, flat mound. A rectangular outline of multiple-coursed masonry, oriented so that one diagonal lay along a north-south line (Fig. 1), was partially exposed and best defined on the southeast and northeast sides. Further surface examination revealed additional construction at the north and the south corners of the structure, partially exposed stones scattered inside and outside the rectangle, and very few sherds on or near the site.

Initially, the surface of the ruin and its adjacent areas, except for two large trees, one inside the rectangular outline and another near the northeast side of the structure, was cleared of pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*), which generally cover the surrounding area, and sage (*Artemisia tridentata*), which grows profusely in the bottom of the draw. Once the 1 to 1½ inches of humus or duff, composed largely of juniper and pinyon needles, were removed from the surface in the immediate vicinity of the site, excavation was continued on the assumption that the structure was probably a small unit pueblo. Aside from the identifiable surface data, exploratory excavation revealed the presence of interior and additional peripheral masonry construction, as well as a sloping, irregular, spall-littered floor surface. Three inches of fill covering the irregular surface were troweled, and shovels were used to remove the remainder from inside and adjacent to the structure. A stratigraphic column was retained in each area of excavation. Despite intensive testing, neither a kiva nor a trash deposit was found at Site 52. In searching for these features, which usually accompany a unit pueblo and are situated to the south and east of the main structure, 34 deep test pits were dug in this general area, and one was dug inside the structure. While it is possible that both a kiva and a trash deposit may have been concealed by deposition or destroyed by erosion, their seeming absence, along with the aberrant features of the site,

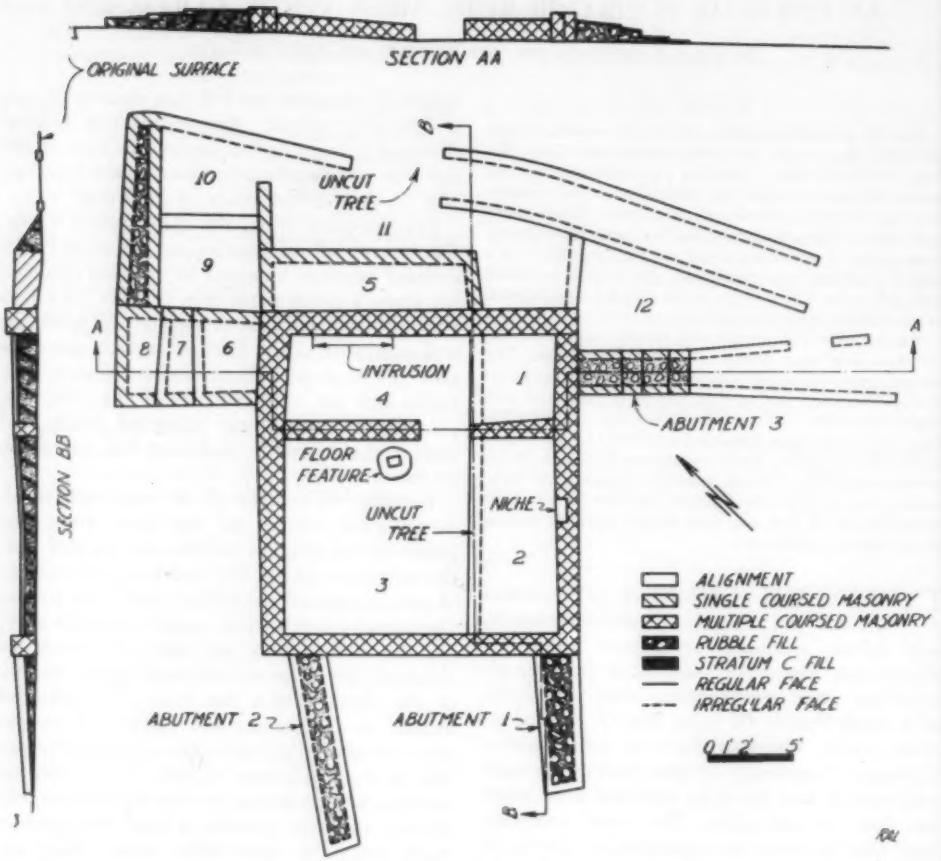

FIG. 1. Plan and sections, Site 52, Mesa Verde

suggests that Site 52 may not have been a small unit pueblo; therefore, the term "Area," instead of "Room," is used here in describing various parts of the ruin.

DESCRIPTION

The completed excavation revealed that Site 52 was much more extensive than anticipated, and that two different strata served as bases for masonry construction. In order to understand some of the architectural problems encountered at Site 52, a few preliminary comments about the stratigraphy of the site are essential. Within the rectangular outline, three distinct strata were noted. Three to five inches of gray-brown loam formed top Stratum A. Below this, a 4½-to-6-inch layer of light chestnut, sandy loam (Stratum B) was clearly differentiated from a soil horizon (Stratum C) which was characterized by a dark red color and a slightly higher percentage of sand than in Stratum B. Beneath the previously mentioned spall-littered surface, Stratum C material continued down to the bedrock of Cliff House Sandstone. Throughout Stratum C, isolated specks of finely flaked carbon and small pieces of sandstone were found. Only the presence of sherds and several concentrations of clay in Areas 1 and 2 (Fig. 1) distinguished the material above the spall surface from that below. In the very bottom of the draw where Site 52 was located, the red, wind-deposited soil which usually rests on the bedrock had been eroded away by water action. Subsequently, Stratum C material was

deposited on the Cliff House Sandstone. In other areas of the site and immediately adjacent to it, but at lesser depth below the ground surface, similar stratified textural, color, and structural differences existed. Deposition of Strata A and B material could be the result either of natural processes or of intentional filling. Sherds and concentrations of clay in Stratum C suggest the possibility of intentional filling with readily available material from the area immediately adjacent to Site 52. The unconformity between Strata B and C marked the base for secondary construction.

Inside the rectangle, spalls were found in Stratum C at a depth of 15 to 17 inches below the ground surface. The sloped, irregular, spall-littered surface marked the original construction level. Prior to construction, the then extant area must have been cleared but not leveled; eventually bases of the masonry construction varied to a maximum of 15½ inches in elevation (for example, even within Area 2, the base elevations varied by more than 6 inches). Stones used in construction must have been trimmed on the spot, and discarded spalls were left where they fell. While this surface is largely discernible because of the sandstone admixture, floor surfacing material was noted in some parts of Areas 1, 2, and 3. Since this material tapered into some of the walls, it must have been applied after the rectangle and a subdividing crosswall were constructed. All masonry construction on the spall surface formed an integral unit.

Initial construction at that level included the following:

A basic rectangle, which was divided into two, major subareas, Areas 1, 4, and 2, 3, by a crosswall;
One stepped abutment appended perpendicularly to the southeast side of the rectangle;
Additional peripheral areas, Areas 5, 6, 7, 8, 9, 10, 11, and 12, at the north corner and along the northeast side of the rectangle;
Several extensive stone alignments (that is, single vertical coursings of masonry) external to the structure.

Secondary construction at the unconformity of Strata B and C included:

Two abutments appended obliquely to the southwest side of the rectangle;
Stone alignments further subdividing the basic rectangle into four areas, Areas 1, 2, 3, and 4.

The rectangle, by which the site was originally identified, was basic to the entire structure. Butting of the southeast wall against the northeast broke the otherwise continuous, multiple-coursed (double and triple) masonry. Standing wall height varied from 9 inches in the south corner to a maximum of about 1½ feet at points along the southeast and northwest walls. While the original height could not be determined, rock litter in the vicinity of Site 52 suggests that the walls of the main rectangle could have stood at least two courses higher. Irregular wall tops and a few displaced, up-ended rocks found in Area 4 and resting on Stratum C also suggest that the walls probably were slightly higher at one time. The possibility of the structure once having been built much higher, dismantled and subsequently robbed of building stones is precluded by the lack of an accumulation both of chinking spalls and of lumps of mortar either in the fill or in the surface stratum. While stones set in the walls were mostly roughly dressed or "unfinished," some faces were finished by pecking, and others by striking off fragments of rock from the long sides to produce a wedge-shaped edge and exaggerated lenticular section. Pecked stone appeared primarily in the southeast and southwest walls and wedged stones primarily in the lower courses in northeast and northwest walls. More pecked and wedged stones occurred in the exterior than in the interior wall faces. Some of the wedged stones had been further modified by pecking. In a few spots, plaster clung to the interior face of the northeast and southeast walls which formed the east corner of Area 1.

One niche and several irregularities occurred in two walls of the rectangle. The outer, upper masonry courses were offset in the northeast wall at the east corner of the structure. At one point, Stratum C material formed an intrusion in the interior face of the multiple-coursed northeast wall. This irregular intrusion was contained by the exterior coursing at the back and the interior coursing at the top, sides, and bottom. The niche (17½ by 9½ inches) in the interior side of the southeast wall utilized the exterior course of the double-coursed masonry as the back (making the niche one course deep), the top of the inner course as a base, and the ends of two inner vertical courses as sides. While the southwest corner of the niche was vaguely defined, the remainder was faced with one wedged, two pecked, and three unfinished stones. No indication either of a top or of plaster was present. The base of the niche was two courses (about 6 inches) above the floor.

The main rectangle was divided into two large units, Areas 1, 4 and Areas 2, 3, by a double-coursed crosswall butting against the northwest and southeast sides. The top of the standing wall, which appeared intact, stood about 14 inches above the sloping spall level and about 4 inches below the tops of the adjacent standing sides of the rectangle. The crosswall was interrupted near its center by an opening 33 inches wide, which extended from the top of the wall to the floor (Fig. 2). Half the stones facing the opening were finished by pecking; plaster, up to 5/8 inch thick, clung to the wall in Area 2.

In Area 3, an almost circular, flat-topped feature (23 by 22¾ by 8 inches) was constructed on the spall surface (Fig. 2). Two courses of masonry, each consisting of four stones, outlined a space, rectangular in cross section (8¼ by 6 inches), which extended from the top of the feature to the irregular floor surface. Three of these eight stone faces had been shaped by pecking. Around the base, peripheral stones supplemented the basic ones,

Fig. 2. Floor feature in Area 3 and part of the multiple-coursed crosswall, Site 52, Mesa Verde.

and the exterior of the stone framework was covered with a heavy coating of plaster which, with a bold radius, tapered into the floor. Top surfaces of the stones in the upper course and faces of the eight basic stones fronting the space showed no signs of remaining plaster.

Additional construction, supplementing the basic rectangle, was erected on the spall surface. A stepped abutment was built perpendicularly to, but not keyed to, the southeast side of the original rectangle. Abutment 3 consisted of four well defined, but low, steps which ascended from the outside ground level to the top of the wall (Fig. 3). Step heights varied greatly, from 1¼ to 3 5/8 inches; moreover, the height along each step was not uniform. Steps were surfaced with mud and some stones resembled flagging. A fragment of a trough metate was set in the third step. Masonry sidewalls enclosed rubble fill, consisting principally of stones in the higher levels. At the end of the abutment, two alignments diverged away from the structure, and stones were so inset that their tops were only slightly raised above the surrounding spall-littered surface.

Part of the northeast wall of the basic rectangle also served as a wall for Area 5. The other three sides were formed by a continuously laid single-coursed wall which butted against the main unit. During construction, stones were set so that a relatively even exterior, but very irregular interior, face was formed. While most of the stones were roughly dressed, pecked stones outnumbered wedged (12 to one) in the exterior face, but the reverse (eight wedged to one pecked) was true on the interior. Some small sandstone spall chinks were embedded in the mortar. At the east corner of Area 5, the exterior faces of the stones in the third and higher courses were offset and overhung the lower ones. The offset was slightly below that of the east corner of Area 1.

At the north corner of the main rectangle, Areas 6 7, and 8 formed a unit. A continuously laid single-coursed wall, forming three sides and butting against the partially destroyed northwest side of the rectangle, outlined the exterior of this combined area. Both the northeast and southwest sides were double-stepped. Two alignments, situated at the steps, but slightly below the tops of the walls, subdivided the larger unit into Areas 6, 7, and 8. Elevations of the alignment and the northwest wall of Area 8 were progressively stepped down by

FIG. 3. Stepped Abutment 3 and related diverging alignments, Site 52, Mesa Verde.

roughly 2½-inch increments. Alignment construction was begun simultaneously with the southwest wall and later butted against the completed northeast wall. Only the exterior face of the outlining wall and the northwest faces of the two alignments were evenly finished. Some horizontal stone slabs, resembling flagging, appeared at both ends of the alignment between Areas 7 and 8.

Along the northeast side of Site 52, Areas 9, 10, 11, and 12 completed the unit construction on the spall surface. Areas 9 and 10 and part of Area 11 were defined by the previously described masonry construction, two stone alignments, a short wall, and a rubble filled masonry wall. The latter was appended to the north corner of Area 8, and the alignment along the northeast side was a continuation of the outside course of the wall. A short wall, butting against the north corner of Area 5, but not long enough to reach the adjacent alignment, separated Areas 9 and 10 from Area 11. An additional alignment, faced on both sides, divided Area 9 from 10. The northeast side of Area 12 and the remainder of Area 11 were defined by a pair of long, slightly bowed, parallel alignments which were tied to the east corner of the main rectangle by a short alignment, and one of the two alignments extending outward from the stepped abutment. All of the alignments, except the one that separated Areas 9 and 10, were so inset and laid that one side only was evenly faced. Single peripheral alignments that face away from the rectangle had been regularized. The remote faces of the paired alignments were evenly faced.

In addition to the initial construction on the spall-littered surface, secondary construction consisting of alignments and abutments utilized the unconformity of the Strata B and C materials as a base. Inside the basic rectangle, two alignments subdivided Areas 1 and 4 and Areas 2 and 3. One butted the southwest side of the rectangle and the multiple-coursed crosswall, while the other alignment, essentially a continuation of the former, joined the other side of the crosswall to the northeast side of the main structure at a point opposite the southeast wall abutment of Area 5. In the two alignments, 21 different sized stones, 15 of them pecked on

one side, were laid to form even northwest faces while the opposite faces were irregular. Two abutments, appended obliquely to the southwest wall of the main rectangle, were also set on Stratum C material. Continuous stone alignments outlining the abutments were rubble filled. Straight alignments clearly defined Abutment 1; however, some displaced stones marred the original outline of larger Abutment 2. In the northwest face of Abutment 2, equal numbers (four each) of unfinished, wedged, and pecked stones were found.

While the unconformity between Strata B and C did not yield enough data to suggest a well defined occupational level, it is significant architecturally. Various features of the site, such as the oblique abutments and the alignments inside the basic rectangle, had been constructed on the surface of Stratum C, while others, the crosswall and walls of Area 5, must have been built at least as high as or slightly higher than the unconformity. Adjacent features appeared at very nearly the same elevation (Fig. 1, Section BB); however, while absolute elevations of some of the construction differed, the variations will be explained in terms of deliberate construction. Relationships between elevations of the features are shown below.

Upper elevation, nearly identical:
- Top of alignment inside the main rectangle
- Top of the part of southeast wall of Area 5 closest to the above alignment
- Top of that portion of the crosswall butting against the southeast wall of the main rectangle
- Top of the intrusion in the northeast wall of the rectangle

Intermediate elevation, 2½ inches below the upper elevation:
- Base of the alignment inside the main rectangle
- Base of the northwest side of Abutment 1
- Surface of the top step of Abutment 3
- Top of the northeast wall of Area 5

Lower elevation, 5–6 inches below the upper elevation:
- Bases of the southeast sides of Abutments 1 and 2
- Base of the niche
- Base of the intrusion in the northeast wall of the basic rectangle
- Top of the floor feature
- Top of the crosswall joined to the northwest side of the rectangle at a point adjacent to the wall opening

Both wall offsets were below the lower elevation

The intrusion in the northeast wall of the main rectangle and the offsets in the upper portions of the exterior walls in Areas 1 and 5 further suggest two possibilities: (1) the partial destruction of Site 52, filling of the interior and the immediate peripheral areas with Stratum C material, and subsequent secondary construction or reconstruction on the fill material; (2) the filling of the Stratum C material before the masonry work was completed, continuing construction.

In summary, the construction techniques were congruous with those found in the San Juan Anasazi area, although the rubble fill in the Mesa Verde is by far less common than in the Chaco. Most of the stone work, except for three rubble-filled abutments and one double wall, was solid masonry. In building, stones forming wall bases and alignments were set in shallow trenches. Walls defining large areas tended to be continuously constructed, and vertical coursing was present in all of them. Multiple-coursed masonry was confined to the wide basic rectangle wall and an internal crosswall. Most stones utilized in building were roughly dressed or "unfinished" (77%). Fewer were pecked (13%) or wedged (10%). At least some of the stones (for example, nonlocalized fire-reddened, wedged stones modified by pecking, possibly the wedged ones) had been used previously. Stone sizes varied from the largest (26 by 10 by 4 inches) incorporated into the basic rectangle to small spalls included as chinking and inclusions in the plaster. In some walls, and all but one alignment, various sized stones were laid in such a manner that they formed a single even face. Limited horizontal slab construction resembled flagging.

From surface indications, three other sites on Chapin Mesa are similar to Site 52. All four low, flat-topped mounds include rectangular outlines of multiple-coursed masonry. Neither a trash mound nor a kiva depression is observable at any of these sites. On the basis of surface examination, a site lying just outside Mesa Verde National Park on the Ute Mountain Indian Reservation is most similar to Site 52. Here multiple-coursed masonry walls of large stones are easily seen. Site 38, approximately ½ mile south of Twin Trees site, is much larger than any of the others, and, in addition to the multiple-coursed walls which outlined the structure, a crosswall appears to divide the large rectangle into two subareas. Lastly, Site 55, near Site 52, was difficult to identify because the multiple-coursed stones were slightly exposed. Archaeological investigation of these three sites

and comparison with architectural data from Site 52 are highly desirable.

Aside from the architectural manifestations, few data suggest human usage. Non-artifactual data were limited to fragments of poorly preserved charred wood and fire-hardened earth found in the area between the oblique abutments and near the top of Stratum C. Since the few fire-reddened stones incorporated in the masonry were not localized, reddening must have preceded the unit construction. Stone artifacts consisted of a few fragmentary ground objects and basalt flakes. Fragments of ground sandstone objects included parts of a unifacial mano made of material foreign to the Mesaverde (geological) Formation, a piki stone, and three different metates. Except for a metate fragment from the fill of Area 2, all the ground stonework came from areas exterior to the rectangular structure. Two of five basalt flakes bore positive usage marks. One unused basalt flake, without a bulb of percussion, came from beneath the spall level in Area 11, but all the others were found in interior fill.

Of the 70 sherds found during the excavation of Site 52, one was found below the basic rectangle, and two were found beneath the spall zone under other areas of the structure. The three sherds included one McElmo Black-on-white sherd from under Area 3, one Moccasin Gray sherd from below the area adjacent to the main rectangle and Area 6, and one unclassified San Juan white ware type sherd from beneath Area 9 (Table 1). These sherds had washed into place in the draw before initial construction had begun.

TABLE 1. SHERD DATA, SITE 52*

Type	Location			
	Below Spall Surface	*On Spall Surface*	*Upper Fill*	*Surface*
San Juan Red Ware				
La Plata Black-on-red			1	
Mesa Verde Gray Ware				
Chapin Gray		5	10	
Moccasin Gray	1			
Mancos Gray			3	
Mancos Corrugated		1	1	1
Unclassified corrugated		8	9	
Unclassified plain		2	2	
San Juan White Ware				
Chapin Black-on-white		1	1	
Mancos Black-on-white		3	6	1
Unclassified	1	3	2	3
Mesa Verde White Ware				
McElmo Black-on-white	1		1	
Unclassified				1
Unidentified			2	
Total	3	23	38	6

* Groupings are based on the descriptions by Abel (1955) since a more recently completed revision of Mesa Verde ceramic taxonomy is as yet unpublished.

DISCUSSION

On the basis of the single McElmo Black-on-white bowl fragment found under Area 3, a minimal date of about A.D. 1100 is indicated for the initial construction of Site 52. The 61 sherds from the spall surface and from the upper fill cover a time period spanning the entire Mesa Verde occupation, from A.D. 575 to 1300.

Furthermore, pecked stones, sandstone spall chinking, multiple-coursed masonry, and rubble or core construction are Pueblo III manifestations and suggest a similar lower time limit of about A.D. 1100 for construction. All but the latter construction techniques are reported from Unit Pueblo II and associated towers at Site 16 in the Mesa Verde, which have been dated A.D. 1074 (Lancaster and Pinkley 1954: 42–4, 49). Since these stone-working techniques found at Site 52 were in effect until the evacuation of the Mesa Verde, about A.D. 1300, no other terminal date can be postulated. However, the uniformly dimpled pecked effect found on the faces of building stones utilized in the tower at Sun Point Pueblo, tentatively dated about A.D. 1200, is lacking in Site 52 (Lancaster and Van Cleave 1954: 98–9, 103). If both stone masonry techniques and pottery are used as time indicators, initial construction may be assumed as taking place some time between A.D. 1100 and the abandonment of the Mesa Verde. Site 52, therefore, may be classified as Pueblo III.

Use, function, and meaning of Site 52 can be tentatively suggested. The possibility of the site having been used as a domestic structure is eliminated on the basis that none of the usual household features are present; for example, floor or living surface, firepits or burned floor areas, refuse deposits, domestic utensils. Even the fragments of metates, mano, and piki stone probably came from the deteriorating walls. A kiva, normally associated with living rooms, was not present. Furthermore, the architectural features and suggested over-all height were markedly different from other habitation sites. The structure was uniquely set near the bottom

of the draw and apart from others in the immediate vicinity. Since the area was potentially good for farming, the structure may have been related to agricultural activities; however, other data do not support this conjecture. Instead, Site 52 seems to fit into a complex of non-domestic structures found in the Mesa Verde. The latter, which appear to be basically ceremonial, include a variety of forms and sizes ranging from small shrines to large and complex structures like Sun Temple, Fire Temple, and Cedar Tree Tower.

If construction on the initial spall-littered level is considered alone, some similarities to Puebloan towers must be noted. First, massive walls of the basic rectangle are reminiscent of those in towers at Site 16 in the Mesa Verde (Lancaster and Pinkley 1954: 47), but the shape is more like that of the square-cornered towers found in the Gallina country (Hibben 1948: 32–6). Second, the undisturbed multiple-coursed masonry crosswall subdividing the main rectangle resembles the low partitioning walls on the ground floors of towers in the Hovenweep area just west of Mesa Verde. Until the excavation of Sites 52 and, later, the small surface Site 981 (Luebben, Rohn, and Givens 1958), full breaks in walls were unreported for the Mesa Verde; but at Alkali Ridge, Brew (1946: 194) found a floor-level door with a mud sill. On the initial construction level, this kind of opening in the multiple-coursed masonry crosswall at Site 52 suggests a passageway. Several towers in the Mesa Verde do have floor features; this one at Site 52, however, differs from the slab-lined bin associated with the earliest floor level at Sun Point Pueblo (Lancaster and Van Cleave 1954: 101), and from the circular, sipapu-like hole in the floor of Cedar Tree Tower. Even though the structure did not occupy an advantageously elevated position, it may have served as a detached tower. If so, the added areas, alignments, abutments, and the second level of construction remain unexplained. Or, why should the two sets of step forms have been built against the walls of a tower? Moreover, the lack of many building stones, of chinking spalls and of lumps of mortar in the fill seems to preclude the possibility of the remaining structure once having been the base of a subsequently dismantled tower.

When the entire structure is considered as a unit, a number of problems appear. Did, for example, we unsuspecting archaeologists err when we completely excavated the site? Should the basic rectangle, Area 5, and the adjacent area have been excavated only as far as the unconformity between Strata B and C, even though no uniformly packed surface was readily identifiable at this elevation? For Areas 6, 7, and 8, which formed an integral unit, excavation probably should have been halted at the tops of the extant stepped walls and associated earth-supported alignments which tied the walls together, thus forming a rubble-filled stair unit. Here interior wall faces, which were to be concealed with fill material, were left very unevenly finished. Since the interior faces of other walls and most alignments were unevenly faced, the question of complete excavation is again raised. Furthermore, standing wall heights, probably two or three courses lower than when originally built, ruled out deposition of Stratum C material as well as sherds within the main rectangle and Area 5 by ordinary flooding. After the addition of Stratum C material inside and outside the main rectangle and Area 5, the structure certainly would have resembled a low platform mound, or truncated pyramid. Secondary construction, namely the oblique abutments and alignments inside the rectangle, could have then been started. The latter divided the surface of the mound into Areas 1–2 and 3–4. Stratum C material filled into the area between the irregular, southeast faces of the alignments and the main rectangle walls would have elevated Area 1–2 above Area 3–4. Elevations of the multiple-coursed crosswall at points adjacent to the wall opening verify the existence of the split-level construction (Fig. 1, Section AA). Tops of the walls of the areas making up the core of the structure, stepped abutments on opposite sides, additional plain abutments on the third side, and numerous alignments appeared above the surface of Stratum C material. If the structure was a mound, the floor feature formed a rectangular opening in a surface. The multiple-coursed crosswall, however, could have served either to stabilize fill within the main rectangle or to support some kind of superstructure. The secondary level of construction and the step forms leading up to that elevation are more reasonably construed as parts of a deliberately filled-in platform than as elements of a tower. During flooding of the draw, an elevated platform would have been very desirable. Less

complex platforms are found in the Mesa Verde. A few hundred yards northwest of Far View Ruin, a round tower is superimposed on a small square masonry platform, three courses high and measuring about 12 feet on a side. Site 52 as a platform mound would have been quite unlike others from the San Juan Anasazi or Hohokam areas.

In considering either the initial construction or the secondary level, one might assume the floor feature to have been the center of an elaborate shrine. As a shrine, however, the total structure would have been far more elaborate than that from the Chama Valley reported by Wendorf (1953: 53), or those in the old Hopi villages described by Stubbs (1950: 109–12). Even so, the possibility of Site 52 as a religious structure should not be discounted.

Other architectural elements also pose interesting problems. Were the two sets of open masonry step forms appended to the main rectangle used as stairs? In stepped Abutment 3, the low, uneven, small steps are sharply defined; however, it is problematical whether the abutment would have sustained human traffic. On the other hand, combined Areas 6, 7, and 8 unmistakably formed a flight of large earth-surfaced steps which would have been suitable for such use. Under either possibility, the step conformation is markedly different from that reported in Pipe Shrine House and Site 875 in the Mesa Verde where very wide steps, enclosed at the ends, marked a transition from one general plaza level to the next. Similar inset, but narrower, stairways appear in Chetro Ketl (Talus Unit 1) at Chaco Canyon. As Ferdon (1955: 6) points out in a provocative paper, any kind of step features, other than in pit houses, is uncommon in the Southwest.

The other abutments, added as a part of the second level of construction, may have served either as ramps or as decorations. Their location and weak construction preclude their use either as water deflectors or as reinforcing buttresses. The area between Abutments 1 and 2 may have served either as a graded approach or as an apron. Here, near the top of Stratum C material, the only evidence of fire was found. Inside and outside the main rectangle, alignments tended to subdivide or to confine areas. Since the extensive alignments along the lower east side of the structure were only a single course high and the stone tops were nearly flush with the surrounding spall surface, they were wholly inadequate to protect the site from possible flooding. Areas between the two paired alignments, although not surfaced, could have served as paths or ways. While one pair led up to the stepped abutment, the other concentrated attention along the northeast side of the structure. Perhaps these alignments, too, were merely decorative? Or was the entire site meant to be an effigy?

SUMMARY

Complete excavation of Site 52, a small surface structure in the Mesa Verde, yielded several architectural phenomena which previously had not been reported from San Juan Anasazi sites. A crosswall with a floor-level opening, a floor feature, step forms, abutments and alignments were added to a basic rectangle of multiple-coursed masonry. Construction techniques and limited pottery evidence suggest that Site 52 was built during Pueblo III. Furthermore, the site is unusually situated near the bottom of a draw rather than along the ridge of the mesa. Data suggest that Site 52 may have been a platform mound of ceremonial, rather than domestic, significance.

Acknowledgments. In 1951, the National Park Service, United States Department of the Interior, began an archaeological survey of Chapin Mesa, Mesa Verde National Park, Colorado. Under the direction of Staff Archeologist, James A. Lancaster, a number of surface ruins, markedly different from previously reported data of San Juan Anasazi manifestation, were located. In an effort to evaluate some of the survey data, a permit for excavation of Site 52 was granted us by the National Park Service. We wish to thank Oscar W. Carlson, then Superintendent of Mesa Verde National Park, for his cooperation, as well as Don Watson, James Lancaster, and Jean Pinkley for technical assistance and advice.

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CERAMIC SEQUENCES IN EL SALVADOR

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ABSTRACT

Field trips in 1953–54 and 1958 and the checking of about 150 sites provide the background for these preliminary sequences. El Salvador is divided into three cultural regions. Western El Salvador is strongly linked with Guatemala and Mesoamerica while the eastern region is basically Central American. The central part of the country is heavily influenced by both of the other regions with the Mesoamerican component predominating. In the western sequence the Atiquizaya phase is connected with the Las Charcas or Providencia phases in the Guatemalan Highlands and the Cuyagualo phase with the Full Classic material at Copán. The latest complex in the western region, the Majahual phase, possibly flourished during the conquest period on the western shore. The central sequence begins with the Tovar complex about 700 B.C. and ends with the Cihuatán phase which demonstrates the Pipil domination of this region in later times. In eastern El Salvador, where archaeological knowledge begins with the footprints of La Rama at about 1500 B.C., several complexes with wares made in the Usulután technique developed. The eastern sequence culminates in the Lower Lempa culture about A.D. 1000.

THIS REPORT is based on two field trips in El Salvador, Central America (Fig. 1), one of 15 months in 1953–54, the other of four months in 1958. During both occasions, an extensive survey of sites was conducted covering about 150 spots of archaeological interest at which surface collections were obtained. In some cases where prospects looked rewarding or puzzling problems had to be solved, test trenches or pits were excavated during both seasons. Unfortunately, none of them was stratigraphic and only cross-checking gave the basis for this proposed time sequence of Salvadoran archaeology. To date scarcely any report has been published on these expeditions and even this paper has to be preliminary as all writing has had to be done from field notes and those drawings and photographs taken in the field. Archaeological work in El Salvador proved to be especially difficult due to a reluctance of certain government agencies to cooperate, although other agencies, especially the Museo Nacional in 1958, gave me valuable assistance. Therefore, not a single sherd could be exported, not even on a proposed loan basis, and all material still rests in El Salvador, its scientific value diminishing rapidly. This reluctance is, in my opinion, the most important reason why knowledge of Salvadoran archaeology has not progressed significantly since the publication of Longyear's data in 1944. Fifteen years of excellent excavations and thorough reconstruction at Tazumal by Stanley Boggs have still to be reported, but will certainly amplify the western sequence.

Another difficulty in this particular region is the diversity of cultural remains in space as well as in time, certainly due to the fact that El Salvador belongs to the important frontier region between the major archaeological areas of Mesoamerica and Central America (Haberland 1959). Therefore, if one samples ten sites sufficiently spaced out over this republic, at least five different complexes are to be expected and it would not be surprising if all ten show different contents. The following preliminary report is an attempt to give some order to certain ceramic complexes found during the investigations as well as those mentioned before from El Salvador. Not all the different ceramic associations can be mentioned here, since their content as well as their position in time is often not sufficiently understood — a fact especially due to the most complicated picture in the eastern third of this country. However it is hoped that most of the major assemblages are shown in Figure 2.

In this chronological chart a distinction is made between western, central, and eastern El Salvador, the latter region already well used and sometimes defined. Nevertheless, it seems useful to give first an idea about the frontiers between the different regions in order to clear up the picture before going into details. Both dividing lines are still difficult to draw, the one between the western and the central region more so than the other. As indicated by the map (Fig. 1), this line should be understood, at present, as starting at the Pacific coast at La Libertad, crossing the Panamerican Highway near the village of Colón and then following the western slope of the volcano of San Salvador. Next the town of Quetzaltepeque is touched, after which the line follows the watershed between the Río Sucio and the Río Acelhuate up to the Río Lempa. Conditions north of this river are so unknown that no attempt to draw a dividing line there could be ventured. The frontier between central and eastern El

Fig. 1. Map of El Salvador, showing sites mentioned in the article. The dotted lines are the frontiers between the three archaeological regions.

Salvador seems much easier to define since the Lempa River has been accepted as the boundary line for a long time in most publications (for example, Lothrop 1939). However, investigations show that this is not true, especially in Classic and Postclassic times when the Lower Lempa culture is found on both sides of this river. The new borderline is, therefore, tentatively placed along the Río Jiboa up to the San Vicente Volcano and from there to the mouth of the Río Titihuapa emptying into the Río Lempa. Since these regions are more or less artificial and include several geographic entities, it is understood that they will be of passing value and that most probably other regions will have to be formed in the future. Some evidence for this will be offered in the following discussions.

We shall go in the course of this report from the west to the east and from the oldest to the latest cultures, giving at the same time a short definition of contents as well as a discussion of, or a reason for, the time placement. Under this system the Atiquizaya complex has to be mentioned first. This complex has been described in a prelimintary report (Haberland 1958), and recent investigations have added only a few features such as spouts with ovoid diameter and figurines with movable arms. The most important new find during the last season was the rim sherd of a flattish bowl, unpainted on the exterior and with a purplish-red decoration painted over a white background on the interior. The fact that this is the only such sherd among thousands of sherds at this site indicates that it is an import. All features suggest that it derives from the Providencia phase of the Guatemalan highlands (M. D. Coe, personal letter). This sherd gives the complex more or less the same affiliations as already suggested in the earlier report (Haberland 1958: 489–90) on the basis of other traits. Other general connections seem to be with the Conchas phase of the La Victoria sequence on the Pacific coast of Guatemala (M. D. Coe, personal letter), again indicating the same time level. A placing of the Atiquizaya complex between 1000 and 700 B.C., that is, roughly into the time of Las Charcas and Providencia, seems therefore correct. Another question is whether there are more sites of this type in western El Salvador. In the above-mentioned report (Haberland 1958) the site of Atalaya was included, in spite of the lack of certain features, for example, extensive grooving. It is supposed that this lack might only indicate a spatial difference, while some exact duplications in material and ornamentation suggest the same

Time	Period	Western El Salvador	Central El Salvador	Eastern El Salvador
1400		Maja-hual		La Pitaya
1300		Cihuatán	Cihuatán	
1200				Los Llanitos
1100	Plumbate		San Francisco / Santo Tomás	
1000				Lower Lempa
900	Full Classic (Copador)	Cuyagualo	Santa Clara	
800				
700				
600				
500	Early Classic			
400				
300				
200				
100				?
0				Los Frailes
100				?
200				
300				
400				
500				
600				
700	Providencia	Atiquizaya	Tovar / Apastepeque	
800				
900				
1000	Las Charcas			Gualacho
1200				
1500				La Rama Footprints

FIG. 2. Tentative sequence of ceramic complexes in El Salvador.

time level. Another site east of Acajutla, Barra Ciega, yielded some similar material, but this is so mixed up by agricultural action that only extensive excavations will produce reasonable data from this most important, obviously stratigraphic site. Pieces in private collections suggest sites of Atiquizaya type around the Santa Ana volcano. One more site might be included, that of El Trapiche near Tazumal, excavated by William Coe in 1953–54 (Coe 1955), but since that material is also still in El Salvador, no final report could be written. It is therefore impossible to make more detailed comparisons.

Unfortunately, little material out of the most important sequence in western El Salvador, Tazumal, has been published by Boggs (Longyear 1944: 56–72). His report only covers the first out of 15 seasons and the picture is not

clear at all. Boggs distinguishes between an early and a late phase, but both include traits obviously from different complexes and time levels, for example, the sherds pictured in his Plate XIV–B, as far as they are of the late phase, can be assigned in our sequence from Full Classic to the end of Postclassic. For this reason I am not able to include this important site in Figure 2. It may be possible that the early phase includes, besides Full Classic, also some Early Classic material. These stages are represented in some private collections. However, no pure site of this time or the preceding Late Preclassic has been found up to date. Therefore, the next complex is Cuyagualo, known from a site northeast of San Andrés (Fig. 1). This complex is fixed in time by the presence of Copador-style pottery, which is equivalent to Full Classic at Copán (Longyear 1952: 30, 99–101). Most frequent are large wide-mouthed vessels, painted brilliant red and showing a flange near the well-rounded bulging lips. Other features include Boggs's "Scraped-slip ware" (Longyear 1944: 61) and black-and-red-on-white polychrome. It is possible that the association found by Boggs at Tula belongs to the same time period (Longyear 1944: 53–6).

Two other complexes are found in this region of El Salvador. One of them, Cihuatán, is not yet represented by a pure site in the western region, but so much material has been found scattered in this area (for example, at Tazumal, Barra Ciega, and Atiquizaya), that the presence of this complex, believed to represent the remains of Pipil culture, is obvious. Details on it will be given during the discussion of the central region. The other complex is found at the Pacific slope of the Balsam Range, where the most representative site is Majahual. It is extremely poor in distinguishing features, since nearly all pottery is either unpainted or much weathered by water action. The same is true for all other sites found to date there, as all belong to the beach area. The only object at Majahual itself which may assist dating is part of a broken roller stamp with what is believed to be a late design. At another site, parts of flat comal-plates were found with a characteristic handle form, also believed to be late. This comal form gives the Majahual complex a connection with the site of El Cajete at the far western coast of El Salvador, where it is again found associated with much coarse pottery. Other features present are: a highly polished red monochrome ware and a black-on-red ware whose designs have been outlined white after firing. This last technique is unusual, but the polished red as well as the comal-plates point to a very late, possibly late Postclassic date. Therefore, for the time being, Majahual, including El Cajete, is understood to be either a local variant of late Pipil culture or the remains of one of the other linguistic groups present here at conquest time.

In the central region, the oldest culture is the Tovar complex which Muriel N. Porter and I excavated in a barranco near the capital (Porter 1955). Little can be added to her report except that a hand-made figurine head, much like those from Atiquizaya, is present. Since Porter's report is not easily accessible the contents of this culture are summarized here: dark brown and orange monochrome wares, both partly with grooved designs, some white ware and Usulután-type pottery. Porter compares these finds with certain material from Guatemala and Mexico and assigns the complex to a position equivalent to Providencia or the beginning of Miraflores (Porter 1955: 112). That puts it roughly on the same time level as the Atiquizaya complex, with which it shares some traits. On the other hand Tovar seems less sophisticated than Atiquizaya, indicating either a less advanced culture at that time in the central regions or a slightly earlier time placement. Since all earlier positions in the chronology are uncertain, some margin of adjustment in absolute time has been reserved. Therefore, both complexes are considered to be contemporaneous and this placement should be generally correct. Around the capital several sites belonging to this complex are generally found under as much as 15 m. of volcanic ash. It is also thought that the finds from the lower level at Cerro Zapote (Lothrop 1927: 173–6) can be assigned to this complex.

The next complex to be dated was given the name of Santa Clara because two undoubtedly Full Classic graves were found and excavated near the capital at Santa Clara. The work was done by José Cepeda Magaña, one of the most enthusiastic amateurs in El Salvador, who generously allowed the examination and photographing of his outstanding collection. From one grave four vessels were saved: two red-brown jars with restricted necks (olla type), a bowl with painting in Copador style, and a straight-walled open vessel with an uncommon

design in black-and-red-on-cream. Among the three vessels from the other grave a Copador bowl is present again, together with two other polychrome vessels. Into this complex fits a recent find from the capital itself, where Classic Maya-style pottery of the straight-walled type and Copador bowls occurred together with two-handled ollas with red-on-gray painting. One of these has an additional band of Copador-style glyphs around the neck. Another group of vessels which should be included is from a grave on the Hacienda de la Patrocina near Suchitoto (Lothrop 1927: 191–2, Fig. 13). If this assignment is correct the ollas with red-on-white painting, sharp shoulder angle, and vertical lip could be included in the set of vessels belonging to the Santa Clara complex. Sites of this type have not yet been verified.

Possibly immediately following Santa Clara is the San Francisco phase which is connected with the west by the presence of Plumbate sherds which assign an early Postclassic date to this complex. The sherd material recovered during a test excavation of the main pyramid at San Francisco (near Los Aguilares) proved to be quite important for the chronology of the later phases of central and eastern El Salvador. Of special value is a red-fine-line ware, sometimes employed over a cloudy orange (which suggests, but actually is not of Usulután type), but mostly on yellowish cream. Other wares include black-and-red-on-white and red-on-gray or red-on-cream, the latter consisting mostly of ollas with two handles and a primitive face at the neck. Minor wares include, besides Plumbate, polychrome vessels with an orange background, somewhat related to Ulua Polychrome, and traces of what may be stuccoed vases. Heads of human figurines are mold-made and generally of Mayoid appearance, while animal heads are hand-made. A certain variant of San Francisco was found in the coastal region of La Paz at the site of Santo Tomás. Here red-on-cream or red-on-gray ollas (the ground color seems to be dependent on the firing) and red-fine-line vessels are represented as well as a certain amount of black-and-red-on-white. In contrast to San Francisco, Santo Tomás shows additional traits derived from or inspired by the Lower Lempa culture, such as hand-made human figurines and purple polychrome, both strongly related to this eastern culture. Nevertheless, influence from San Francisco predominates and assigns Santo Tomás to the same time horizon as San Francisco. Since at least one more site of the same composition has been found in this general area, Santo Tomás is regarded as a regional variant, divided from the main development in the drainage of the Río Acelhuate by the Balsam Range and flourishing in the coastal plain of the province of La Paz. Possibly the find at the upper level of Cerro Zapote also belongs here, but unfortunately no ground colors are given for the few published sherds (Lothrop 1927, Figs. 9, 10). The general appearance suggests that the polychrome sherds have a whitish background, bringing them close to San Francisco. On the other hand a hand-made figurine, or rather a part of it (Lothrop 1927, Fig. 11), suggests either a closer connection to Santo Tomás, just over the ridge, or a slightly earlier time. Since the text is not clear either (Lothrop 1927: 182–5), nothing definite can be said about this important site.

The final phase of central El Salvador is that of Pipil predominance, here named after the most important site of this region Cihuatán. Not much work has been done here, but there is enough information from this site as well as from elsewhere in the vicinity to give a rough picture of this culture. Outstanding are extremely big, column-shaped incense burners, unpainted and covered with spikes, mostly decorated as well with a Tlaloc face. The same face appears on smaller, hourglass-shaped vessels, possibly also incense burners. Obviously Tlaloc and the rain cult played a predominant role during this time (no earlier Tlaloc images have been seen in El Salvador), as not only shown by the various decorations but also by a number of frog figures of different sizes. Other distinguishing features are highly polished black or red monochrome wares, often in shape of bowls with straight walls, decorated by horizontal fluting, and fitted with three or four legs which are very high in comparison with the vessels they are supporting. They are either pointed or flat at the base, round, and either mold-made with a relief (often a human figure) in front, or incised (again the Tlaloc face is frequent). Other hollow feet are in shape of bird heads and are also mold-made. Polychrome pottery seems to be absent. A significant bichrome, red-on-buff, is present, with the red painting ornamenting the interior of the bowls over a buff to brown slip, while the outside is polished only. Here, as in most other

cases, execution of the designs is crude and careless, and in general a decline in quality from San Francisco to Cihuatán is obvious. Other designs besides the Tlaloc faces show a marked influence from central Mexico, which goes well with the proposed ethnic identification of this complex. As mentioned above, Cihuatán has also been found at different spots in the western region of El Salvador.

The possibilities of dating the different ceramic complexes in the western and central parts of El Salvador were reasonably good, because these regions still belong to the Mesoamerican area. Imports from or similarities to the well-known sequences from Guatemala and Mexico are to be expected. This ceases suddenly when one crosses over to eastern El Salvador, entering the archaeological area of Central America. Not only the sequences change abruptly, but also the whole concept of pottery making and decorating changes, with a few fortunate exceptions. Only by reference to some of the previously described complexes, especially those from the central part, can any semblance of chronological sequence be established. This method of correlation, however, doubles the possibility of error.

This trouble arises immediately with the oldest culture here, Gualacho, which is preceded by the human footprints at La Rama (Haberland and Grebe 1957). Recent investigations, especially in comparative soil stratigraphy, and a new dating of Gualacho suggest now a date of approximately 1500 B.C., if not earlier, for the La Rama remains. The sherd material of Gualacho type has been recovered from a barranco of the same name at considerable depth (Haberland and Grebe 1957: 285, Fig. 4 *a*). Nearly 80% is an orange ware, the shapes of which include rounded open-mouthed vessels with wide outflaring rims, globular jars sometimes decorated by a single raised band around the neck, bowls with either outflaring or nearly straight walls and four big mammiform legs, and rounded bowls with a flat bottom. A reddish ware occurs mostly in globular vessels without neck and with two big strap handles placed high up near the rim. All these vessels are thick walled and quite large. A few sherds show some traces of a whitish slip, sometimes combined with crude incising. The only true bichrome ware (the reddish ware is a bichrome in a certain sense too since the lower part of the vessels is unpainted) is Usulután, which is not too frequent (approximately 5%) and whose shapes are the same as those of the orange ware. These sherds are the only ones which could be used with certainty for comparison. But neither those at Atiquizaya nor those at Tovar are as crude as those from Gualacho, indicating either that the farther east one goes, the more primitive the pottery was at a given time, or that Gualacho is much earlier. I believe the latter explanation to be more correct, especially since otherwise, Usulután-type pottery has scarcely anything to do with the shapes of other wares present in a given complex, while at Gualacho the negative-painted ware is fully integrated into the orange ware, distinguished only by the decoration. Another clue is the absence of any polishing. This reasoning gives Gualacho an earlier age than Atiquizaya and Tovar, a date not later than 1000 B.C. It is possible, that this may represent one of the sources of the important Usulután-technique. Gualacho-like material was recovered at some other points in the general vicinity of this site, but never enough for assigning it certainly to this complex.

In this connection the site of Apastepeque has relevance. It is situated near the lake of the same name between the San Vicente Volcano and the Lempa River. Here a generally similar group of material has been found with a heavy percentage of orange and Usulután-type wares, making up together nearly 90%. But both wares are much more sophisticated than Gualacho showing considerable polishing and some incising and grooving. The shapes, too, are more complicated than the simple and much heavier Gualacho forms. In shape Apastepeque shows more resemblance to Atiquizaya types, with which it shares certain negative-painted shapes. On the other hand, there are indications that Apastepeque might have derived from Gualacho, especially in some peculiar painting techniques. Since it is not certain whether Apastepeque belongs to the central or to the eastern region (certain indications point more to an eastern tradition), I have put it between both of them on the chronological chart and placed it on the same time horizon as Atiquizaya. This supplements in a certain way the placement of Gualacho at an earlier level.

The next complex shares one trait with Apastepeque as well as with Atiquizaya, spouted vessels. This Los Frailes complex consists again of mostly orange wares, which play a major role throughout the eastern zone. In this case the pottery is not polished. Among the shapes, olla-like jars, sometimes with spouts, are predominant, while others include globular vessels without neck and open bowls. There is a certain amount of Usulután-type painting as well as some brownish and cream monochrome wares. Decoration is rare. If present it consists mostly of incising, but some crude painting is also found. Among the latter ones a red painted geometric design in broad lines over a negative-painted background is especially interesting and important. All this indicates that Los Frailes is later than Gualacho, from which it is certainly derived, but just how much is difficult to ascertain. Red painting over Usulután is usually quite late, but here again not sufficient material is known. The lack of polychrome pottery is another characteristic, but gives again no real clue. It might be, that we have here one of the rare Late Preclassic sites, but this is really guess work, as is the placement in the chronological chart.

The most important complex in the eastern region is the Lower Lempa culture. A large number of sites of this culture cover the lowlands between the Río Jiboa, the Pacific Ocean, the town of Usulután, and the eastern volcanic chain, sometimes spreading north from there. Outstanding among the pottery is purple polychrome ware, whose designs are partly geometrical, partly derived from animals and often crudely painted. The most characteristic shape for this ware is an open bowl with nearly straight walls and rounded, flat-bottomed body. Together with it are found red-fine-line, a crudely painted red-and-black-on-cream or red-and-black-on-light orange, and Usulután types, usually with red painted rims. Among the monochromes orange is again widely predominant. There is a great variety of vessel shapes, with bowls and wide-mouthed jars most frequent. A large array of big hollow feet, mostly painted polychrome and in different shapes including abstract animal heads, are another important feature of this culture. All figurines are hand-made and are abundant at most sites. Two shapes are typical: (1) full standing (if larger, hollow) human figures, whose heads have heavy upper eyelids, large deep holes in the center of the eye, a bulbous nose, and a small round mouth; (2) a squatting figure, with identical human bodies but different outsized heads, often combining human and animal forms. Certain groups of headdresses may indicate what some figures depict. Pottery drums, bark beaters, obsidian arrowheads, spindle whorls, and basin-shaped metates are other features of this culture. Test digging at the large and important site of San Marcos Lempa revealed the same material down to a depth of 1.70 m., without reaching the bottom and without any indication of change. Considering the high number of sites and the often astonishing amount of ground covered thickly by them, there must be an intensive and long occupation for this culture. To date it is comparable only to Santo Tomás, a bond strengthened by a Plumbate sherd at one of the Lower Lempa sites. Nevertheless, it is thought that this culture covers a larger span of time than only Early Postclassic. An extension into Full Classic cannot be proved yet, but seems logical according to all influences.

Two additional complexes are closely connected with the Lower Lempa culture. One is Los Llanitos, excavated and reported by Longyear (1944). Some traits of Lower Lempa culture are present, such as feet and some of the polychrome wares, especially Longyear's Fine Line Polychrome. Other features are difficult to ascertain, like the purple polychrome which may be the same as Longyear's Los Llanitos Polychrome, but he calls the distinguishing color "muddy red (almost purple on many specimens)" (Longyear 1944: 36). Other features are absent or not mentioned enough, like the important figurines, or very rare, like Usulután technique, of which only two specimens, overpainted in red and black, were found at Los Llanitos (Longyear 1944: 37), while they make up quite a percentage at Lower Lempa sites. Although the connection is strong, it is felt that Los Llanitos is slightly later than Lower Lempa, because of the grooved wavy bands beneath the rim (Longyear 1944, Fig. 24 *h*) which are often found with a blue filling (a late feature) among certain later materials in the Quelepa region. Here the situation is so very complicated, with Quelepa possibly being a trade center or a large and important settlement with a quantity of imported material,

that only large scale excavations could settle the questions here.

The other complex is Madresal situated, like some of the Lower Lempa sites, on one of the islands in the Estero de Jiquilisco. Pieces here were found by two friends of mine on the beach and brought to me. All were quite eroded by water action, but, with exception of the colors, much could still be seen. Among the figurines again the squatting type from San Marcos Lempa is present, but the other forms are absent. Ollas with animal faces are abundant and show a series of different types, which are not represented among the San Marcos Lempa material. A special feature is an olla-like jar with an animal head forming the neck while a second head is applied farther down on the shoulder of the vessel and looks to the rear. This head is solid and has no obvious function. The type has only been found here and all pieces which are in private collections lack provenience. Globular vessels with a high wide neck, jars with four handles, flattish bowls with three or four feet, and big vessels with horizontally outflaring rims are other common shapes here. Further characteristics include vessels ornamented with spikes and sometimes lugs instead of handles. One object may be part of a whistling jar. Big hollow feet are present and much like Lower Lempa specimens. There is no possibility of dating this complex, especially since all painting is destroyed. It is certainly connected with Lower Lempa, but whether it belongs to the same time or is earlier or later is fully unknown. There is a certain late feeling in the pieces, such as the presence of spiked vessels, but these indications are so slight, that Madresal has been omitted from the chronological chart (Fig. 2).

The last complex to be mentioned here, La Pitaya, seems to be quite late. It is again a coastal site, but somewhat distant from the shore which is here more or less formed by the Jucuarán Mountains. The pottery is coarse, either unpainted or monochrome in brown, orange, and cream. The only decoration consists of some molded bands around the necks of ollas. Other shapes include globular vessels without neck and wide-mouthed open vases. Handles are broad and have a characteristic bend, the upper part which usually starts at the rim being horizontal before dropping quite suddenly to the belly of the vessel. A quadrangular stone basin with vertical, ornamented sides and without legs is interesting. Comal-plates have the same handles as at Majahual and El Cajete. Since it is believed that this form is very late in El Salvador, La Pitaya has been assigned to the time immediately before conquest. Sites of similar character are found along the easternmost coast as far as the Bay of Fonseca.

There are, as mentioned before, some more complexes, especially in the east which cannot, at the moment, be included in this scheme by either lack of comparative material, inadequate field notes, or insufficient finds. Most outstanding among them is a group of sites concentrated around the Cacaguatique Volcano and the Sociedad Mountains, which have polychrome pottery and are always found on mountain tops. Another group near the frontier of Honduras and along the Torola valley has no pottery at all, the sites being only characterized by abundant worked obsidian, including some instruments like arrowheads. In general, it is felt, however, that this chronological outline is somewhat correct and gives the approximate date for some of the pottery complexes making up the complicated archaeology of El Salvador. Large gaps are still to be filled, especially during the Late Preclassic and Early Classic time, to which only Los Frailes has been assigned — and this placement is still quite doubtful. There are some interesting historic problems involved, like the importance of the coastal ranges on the development, the origin of the Usulután technique, and the interlacing of basically Central American and Mesoamerican cultures taking place in the central region. All this has to wait an explanation until more material is published. I expect that in the future I will be able to make available all material gathered in El Salvador during both seasons in papers covering complex by complex or site by site, giving all the necessary drawings, measurements, and other details. In the meantime, I hope that this preliminary publication of the ceramic sequences may be of some help to others concerned with this interesting part of Middle America.

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SALVAGE ARCHAEOLOGY ON HIGHWAY 66 IN EASTERN ARIZONA*

WILLIAM W. WASLEY

ABSTRACT

Between May 11 and June 10, 1959, the Arizona State Museum conducted salvage excavations along a section of U.S. Highway 66 from the Arizona–New Mexico state line westward through Lupton for about 5.8 miles. Work in 10 sites with heavy equipment and a large crew of Navajo laborers resulted in the excavation of 16 pit houses, 43 surface rooms, 7 kivas (two only partially excavated), 6 trash deposits, 18 burials, and 21 miscellaneous architectural features. These ranged from Basketmaker III to Pueblo III, with no Pueblo I representation, and included an early Basketmaker III village with Mogollon affiliations. It was possible to clarify the definition of the White Mound phase and to demonstrate a specific front-oriented village plan for the Wingate phase. This intensive excavation produced a large quantity of material and data, thus raising the problems of how to accomplish the analysis of them and the publication of the results. This preliminary report is only a partial answer.

BY ITS NATURE salvage archaeology is a stop–gap measure designed to obtain information from sites which are about to be destroyed. Usually time is at a premium on these salvage projects, so that excavation must be performed within a specified time limit. Not uncommonly the finances available for a salvage project are insufficient or limited, and the archaeologist is then faced with the problem of what small portion of the total picture is the most important to salvage. These limitations and others that may be imposed upon a specific salvage project frequently provide the archaeologist with the challenge of how to obtain "the mostest for the leastest." Methods and techniques thoroughly satisfactory in one situation may be totally unsuited to another. This paper presents the results and the means by which they were achieved for one highway salvage project.

In the spring of 1959 the Arizona State Museum was requested by the Arizona Highway Department to salvage archaeological remains along U.S. Highway 66 (Interstate 40) on a section involving new roadway alignments from the Arizona–New Mexico state line westward through Lupton for about 5.8 miles (Fig. 1). This area is on the Navajo Indian Reservation. A preliminary survey indicated that there were nine ruins, some of considerable size, that would be affected by the new roadway alignments and by the material sources to be used during construction of Arizona Project I–40–5 (23)334. It was estimated that a maximum of 45 working days might be allowed for this work, and on that basis a cost estimate was submitted, providing for the use of heavy equipment, large labor crews, and the employment of two additional archaeologists.

This financial request was approved, but by the time the salvage contract and the permits were arranged, only 30 calendar days remained in which to do the work. Thus, on this project, time was the critical factor; the excavation project was adequately financed. Meanwhile, two competent field archaeologists, Alfred E. Johnson and David A. Breternitz, were committed to the project, pending approval of the budget.

Local Navajo laborers were engaged, and the crew was enlarged from seven the first week to 18 for the next two weeks and to a maximum of 31 for the final eight working days. Earth moving equipment was employed for a total of 44 hours; a D6 tractor and a small carryall were used to remove wind-blown overburden, varying from 30 cm. to 1 m. in depth, from four of the sites in 5 or 8 cm. levels.

One of the nine sites (Ariz. K:12:11) recorded on the initial survey proved upon testing to have been completely destroyed by previous highway construction; there were only a few scattered surface sherds left in the vicinity. Another of the original nine sites was found to consist of three separate pueblos and a pit-house village — actually four sites. A third site contained components of three different time periods, but as there was no geographical separation of these units they have been considered as a single site. A fourth site (Ariz. K:12:3) was not excavated at all. The earlier portion of it had been completely ruined by previous highway work, and the later portions of this site were completely out of danger of being disturbed by the current highway construction. Thus, excavation was conducted in seven pueblos, two pit-house villages, and one mixed occupation locality for a total of 10 sites.

* Contribution to Highway Salvage Archaeology in Arizona, Number 4.

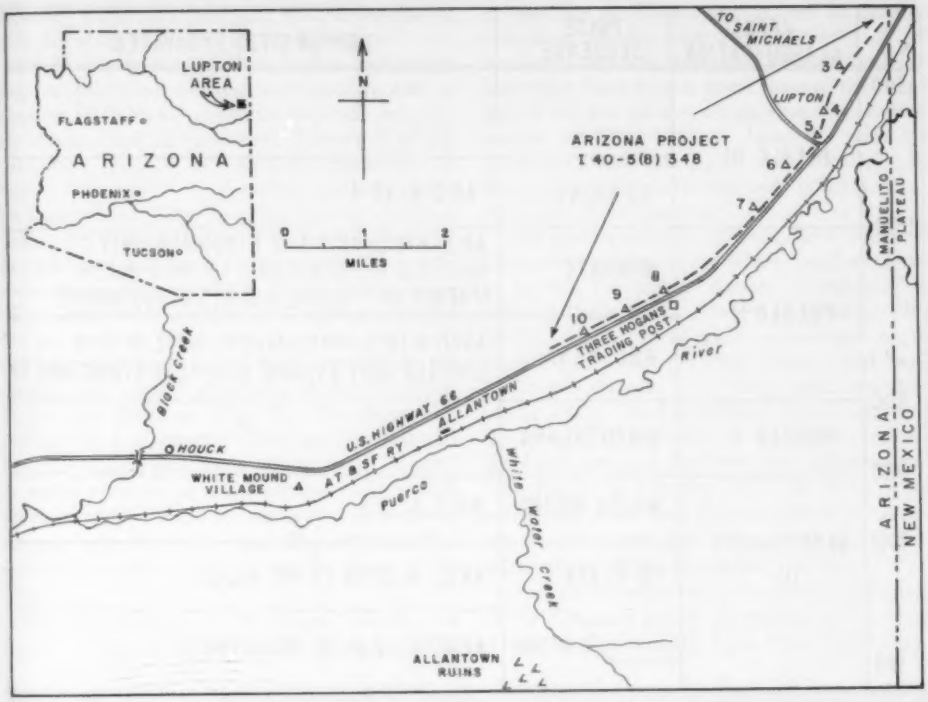

FIG. 1. Map of the Lupton area. Numbers adjacent to site symbols indicate site designations Arizona K:12:3–10 inclusive in the Arizona State Museum Archaeological Survey (Wasley 1957).

During the course of this work at Lupton one additional site was recorded, but it was not excavated since it was not to be affected by the highway construction.

Room outlines for most of the pueblo units were visible on the surface of the ground, so that there was no need to probe or trench for them. In the pit-house villages, however, there was no surface indication of the exact location of individual structures. In one instance their outlines were found by stripping the sand overburden from a large area with the carryall. At the second pit-house village individual structures were located by hand-digging a series of parallel trenches through the 30 cm. or so of sheet trash. This might have been accomplished more effectively by the use of a trenching machine or by stripping the area with the carryall. However, by the time that the heavy equipment could be engaged eight structures had been located by the hand-trenching technique and were in the process of being excavated. In these deep pit houses the compact, clayey fill could have been removed much more easily by using a back hoe or clam, but realization of this advantage came too late.

The use of trowels and whisk brooms, which by necessity makes excavation a time-consuming process, was kept to an absolute minimum. These tools were employed only by the trained archaeologists who had also been trained in the advantages of their limited use. Floors were cleared by Navajo laborers using shovels, as carefully and expertly and much more rapidly than they could have been cleared with a trowel in experienced hands. Too much emphasis, in the past, has been placed on the importance of the classic tool of the archaeologist, while the potential of the villainous shovel in competent hands has been woefully ignored. Among a few aspirants to the noble profession, at least, this reflects an attempt to shun honest toil. It should be impressed upon students of archaeology that there are times when the trowel and whisk broom should be used, and that there are other situations in which the

A.D.	PECOS CLASSIFICATION	PHASE SEQUENCE	LUPTON SITES EXCAVATED
1300	PUEBLO III		
		(EARLY)	ARIZ. K:12:4
1100	PUEBLO II	WINGATE	ARIZ. K:12:5; ARIZ: K:12:8 (BURIALS ONLY); ARIZ. K:12:6 (PUEBLO UNIT 1); ARIZ: K:12:6 (PUEBLO UNIT 3); ARIZ. K:12:10(5 STRUCTURES)
		RED MESA	ARIZ. K:12:7; ARIZ. K:12:9; ARIZ. K:12:6 (PUEBLO UNIT 2); ARIZ. K:12:10(4 STRUCTURES)
900	PUEBLO I	KIATUTHLANA	
800	BASKETMAKER III	WHITE MOUND	ARIZ. K:12:8
700		LA PLATA	ARIZ. K:12:10 (1 PIT HOUSE)
		LUPTON	ARIZ. K:12:6 (10 STRUCTURES)
500			

Fig. 2. Phase sequence and placement for the excavations at Lupton.

use of heavier tools will accomplish the job much more quickly without loss of important information. However, the major task is to learn when to use one method and when the other. The only general guiding rule is to dig rapidly until the specific situation indicates that more care is required, and then to dig rapidly again until the next complication arises.

At all of the excavations sherds and artifacts were segregated by structure and level, and tree-ring specimens and other perishable materials were recovered and preserved as they were encountered. All excavations were photographed and were completely mapped. The material is at the Arizona State Museum.

The ruins excavated ranged from Basketmaker III to Pueblo III, but Pueblo I was not represented at all. With the exception of a Basketmaker III brownware site and the single small Pueblo III site, the ruins may be assigned to the cultural phases of Gladwin's Chaco branch (Gladwin 1945: 5–6). This phase sequence with its approximate dating is presented in Figure 2. The Basketmaker III brownware site has been assigned tentatively to a new "Lupton phase." The excavations can be briefly summarized in terms of this phase sequence.

Basketmaker III

Lupton Phase

The Lupton phase is suggested as a device for identifying a ceramic and architectural complex which differs markedly from that of the normal La Plata phase of Basketmaker III, but which may be roughly coeval with it. Three pit houses, three shallow slab-lined storage cists, four small slab-lined storage pits, and part of a trash area, all representing this cultural complex, were excavated at Ariz. K:12:6 (T22N, R31E, Sec. 5, about 1.1 miles southwest of Lupton, in a highway material pit.

The pit houses were only roughly circular and were relatively large and shallow with vertical pit walls. They ranged in size from about 4 m. in diameter and 50 cm. in depth to about 9 m. in diameter and 80 cm. deep.

None of them was provided with a ventilator, antechamber, or lateral entry of any sort.

Pit House 1, the smallest, had a slightly irregular four-post roof-support pattern and a circular, slab-lined, centrally located, fire pit. Pit House 2 had 22 "post holes," many of which contained charred or decayed fragments of wood. No definite roof-support pattern could be determined from the distribution of these holes. In this pit house the centrally located fire pit was slab-lined (though only two slabs were still in place) and was 80 cm. in diameter. The house also contained a second circular fire pit, or oven, nearly the same size, two storage bins with walls consisting of stone slabs set on end, and a small slab-lined storage pit about 35 cm. in diameter (Fig. 3). The floor was marked by a compact yellow sand burned red in some places, and there was a small "bench" or raised platform at the southeast end. A slab set vertically in the floor served no identifiable purpose and seemed to bear no significant relationship to other features on the floor of Pit House 2.

The 11 post holes in Pit House 3 do not indicate a regular roof-support pattern. The circular fire pit 80 cm. in diameter was located somewhat to the west of the center of this structure. It was not slab-lined, although it may have been at one time. Just to the northeast of the fire pit was an egg-shaped, slab-lined storage pit 80 cm. long. Near the west side of the pit house was a slab set vertically in the floor, again bearing no definable relationship to the other floor features.

The pottery from Pit Houses 1 and 3 was predominantly a brownware which may be referred to as the Forestdale Variety of Alma Plain (Haury 1940: 69–72; Haury and Sayles 1947: 50–2). There were small increments of the Bluff Variety of Alma Plain (Haury and Sayles 1947: 49–50) and Lino Gray, and one sherd of La Plata Black-on-white. Compared with the ceramic complexes of the early phases of the Bluff site and the Bear ruin (Haury 1940: 122, Haury and Sayles 1947: 82–4), it would seem that these two Lupton phase pit houses are roughly equivalent in time with the Cottonwood phase of the Forestdale Valley.

In sharp contrast with the pottery complexes of Pit Houses 1 and 3, the pottery of Pit House 2 was predominantly Lino Gray with only a

FIG. 3. Lupton phase pit house. Ariz. K:12:6, Pit House 2; diameter 8.5 m., depth 0.75 m.

small increment of the Forestdale Variety of Alma Plain and only an occasional sherd of Forestdale Smudged, Woodruff Red, and La Plata Black-on-white. The heavy preponderance of Lino Gray suggests that this structure might be somewhat later than either of the other two, and later than the excavated storage structures whose ceramic complexes were similar to those of the other two pit houses. This suggested sequence of building or occupation cannot be established since the tree-ring material, not yet dated, came only from Pit House 2.

Although the ceramic complexes of Pit Houses 1 and 3 are more nearly comparable with that of the Cottonwood phase in the Forestdale Valley, the architectural similarities of all three pit houses of the Lupton phase are more closely duplicated by Hilltop phase houses in the Forestdale Valley. There are no close similarities, either architecturally or ceramically, between the Lupton phase pit houses and those of the Flattop and Twin Butte sites in the Petrified Forest (Wendorf 1953). Some early La Plata phase pit houses are relatively shallow and roughly circular, but never as large as those of the Lupton phase. The La Plata phase ceramic complex, of course, is quite different from that of the Lupton phase. The Museum of Northern Arizona has recorded other brownware pit house sites of this type not far to the west along Black Creek. It would appear that in this general area there lived small groups of people with a decidedly Mogollon-flavored culture early in Basketmaker III. But if this were the case, they probably were living side by side with people having a pure Basketmaker III culture.

The implications suggested by this situation are numerous and varied. They may be grouped into several broad categories, only a few of which can be discussed here: (1) the range of strong Mogollon influence, (2) the compatibility of Mogollon and Anasazi cultures and culture bearers, and (3) the time at which relatively strong Mogollon influences first appeared in the Anasazi area.

1. *The range of strong Mogollon influence.* The Mogollon culture of the Forestdale Valley has been recognized as a peripheral Mogollon manifestation which received increasingly more Anasazi influence from early to late (Haury 1940: 124–6; Haury and Sayles 1947: 84–6, 88–9). This began in the Cottonwood phase of Mogollon 2 (Wheat 1955: 185) and was already pronounced in the Forestdale phase of Mogollon 3. In the Cottonwood phase this Anasazi influence is represented archaeologically by a small amount of pottery, slab house architecture, and a northern type of milling stone. In later periods other Anasazi traits were introduced.

That this cultural exchange was not unidirectional has been established by work in Anasazi sites of the same periods. The decoration of White Mound Black-on-white pottery of late Basketmaker III (to be roughly equated with early Mogollon 3) often reflects the contemporary Mogollon style of ceramic decoration (Haury 1936: 16–7; Gladwin 1945: 39). During the White Mound phase in the Petrified Forest area between the Puerco and Little Colorado rivers, the Twin Butte site received a considerable amount of unpainted Mogollon pottery (Wendorf 1953: 113).

Wheat (1955: 210–1) has suggested evidence indicating that houses with an antechamber at the end of a lateral entry is a trait that originated in the Mogollon culture and spread northward. In the eastern Anasazi area houses with antechambers appear in Basketmaker III after about A.D. 600, and their distribution extends into the Four Corners area, but this trait did not appear in the Kayenta area. Before the end of the La Plata phase the Anasazi had converted the Mogollon antechamber complex into the Anasazi ventilator complex (Wheat 1955: 211; Wasley 1959: 68–9). The occurrence of rectangular pit houses in Basketmaker III follows essentially the same distribution as the antechamber complex, but it is not clear that the rectangular Basketmaker pit house reflects Mogollon influence. The production of Abajo Red-on-orange in southeastern Utah suggests a northern imitation of Mogollon Red-on-brown, even to some of the layouts and designs used, but it has not been possible to establish direct links with the Mogollon area by which this might have been accomplished.

The Woodruff series of pottery types (Mera 1934: 6–7) represents a striking blend of Anasazi and Mogollon ceramic techniques, and this pottery is found, usually as trade ware, in Basketmaker III sites in the Pureco, Chaco, and Zuni areas of the Anasazi. What creates something of an anomaly in this connection was the finding of a nearly pure Woodruff brownware site north of Gallup, New Mexico (Olson and Wasley 1956a: 55–6), only a mile or two away from a typical La Plata phase village that was probably occupied at the same time (Olson and

Wasley 1956b: 64–5). The center of manufacture of the Woodruff series of pottery types is ordinarily assumed to be in the general Petrified Forest area of Arizona. One might postulate that a group of Petrified Forest Anasazi moved into the area north of Gallup, but in this instance it is much less likely that the Woodruff brownware group represented Mogollon people.

During Basketmaker III, then, from about A.D. 600 on there seems to have been fairly strong Mogollon influence in the central Anasazi area and extending northward to the Four Corners, but not in the Kayenta region and other western Anasazi areas. By comparison with the other occurrences of Mogollon influences that have been observed in the Anasazi area, the brownware village near Lupton (Ariz. K:12:6) presents quite a contrast. With its relatively heavier Mogollon overtones, it would appear to be a Mogollon colony, perhaps from the Forestdale Valley, rather than a particularly heavy concentration of Mogollon traits in an Anasazi community.

2. *The compatibility of Mogollon and Anasazi cultures and culture bearers.* Although the Mogollon community in the Forestdale Valley essentially borders the Anasazi area, the excavations produced no hint of hostility between the two groups. At Cerro Colorado near Quemado in west central New Mexico there is considerable evidence suggesting that Anasazi and Mogollon groups of people were living in the same village at the same time in an essentially peaceful atmosphere (Wasley 1959: 211–12, 215), from late Basketmaker III into Pueblo I on the frontier between the two culture areas. If, for the moment, we can assume that the Ariz. K:12:6 pit-house village and the other Black Creek villages of the Lupton phase were occupied by Mogollon groups of people, then it should be pointed out that archaeological work in the Puerco Valley has not yet produced any evidence pointing to hostility between the Anasazi natives and the Mogollon colonists. Smith (1952: 177) has documented some historical instances of the peaceful mingling of alien peoples.

The two cultures were certainly compatible during Basketmaker III. As far as the material aspects of culture are concerned, which are the only ones directly preserved in an archaeological context, these two cultures were very similar in general pattern and differed only in detail. At a still earlier stage in development, this similarity was also noted by Morris and Burgh (1954: 81–5). Both groups lived in pithouse villages, cultivated small plots of corn, beans, and squash, made fairly simple pottery from local materials, practiced flexed inhumation burial, and hunted as the need arose. In this context a minimum adjustment would be required in the exchange of specific traits and techniques. Perhaps it should be pointed out that this ethnic and cultural compatibility, which persisted into later periods, eventually proved the undoing of the Mogollon. In this atmosphere of peaceful coexistence the Anasazi culture became dominant, although mixed, while the Mogollon culture disappeared as a separate entity. By about A.D. 1000 there was no longer a recognizable Mogollon culture and probably no pure Mogollon ethnic group.

3. *The time at which relatively strong Mogollon culture influences first appeared in the Anasazi area.* Although an occasional Mogollon trade sherd has been reported from early Basketmaker III sites (Morris 1939: 23; Gladwin 1945: 23), cross-cultural influences prior to this time were clearly at a minimum. On the other hand, the most intensive and geographically the most widely spread Mogollon influences in the Anasazi area appeared about A.D. 600 and lasted through late Basketmaker III before they began diminishing in intensity and range during Pueblo I. In the Mogollon chronology this time period would be represented by late Mogollon 2 and early Mogollon 3.

During this period the Anasazi cultural inventory possessed for the first time the following traits (for discussions of these items see Wheat 1955: 206–29): beans, cotton, rectangular pit houses, pit houses with lateral entries, antechamber houses, clay-lined fire pits, stone mortars and bowls, grooved stone mauls, notched bone awls, bow and arrow, wickerwork sandals, plaited sandals, clay pipes, sherd discs, miniature ladles and other pottery forms, the ceramic techniques of smudging, polishing, and slipping, and the following ceramic decorative techniques: quartered, offset quartered, and sectioned layouts; use of rim solids, chevrons, and concentric rectangles; broad-line painting; and polishing over the decoration. All of these traits appeared first in the Mogollon culture, and many of them were introduced to the Anasazi from the Mogollon. The Lupton phase villages may have been highly instrumental in effecting some of this exchange.

La Plata Phase

A single La Plata phase pit house was excavated at Ariz. K:12:10 (T22N, R30E, Sec. 13, about 4 miles southwest of Lupton in the new westbound roadway). The front edge of this structure which faced to the south was removed when the last road cut was made, so that there was no way of knowing if it had a ventilator or antechamber. This pit house was essentially rectangular with a four-post roof-support pattern, and it had a centrally located, circular, clay-rimmed fire pit. The ceramic complex consisted primarily of Lino Gray and La Plata Black-on-white.

Late Basketmaker III

White Mound Phase

Nine structures representing the White Mound phase were excavated at Ariz. K:12:8 (T22N, R31E, Sec. 7, directly opposite Three Hogans Trading Post in the new westbound roadway on the north side of the present highway, about 3 miles southwest of Lupton). Five of the structures were deep pit houses with ventilators and a four-post roof-support pattern. The remaining four structures were comparatively shallow, three of them representing storage structures, and the fourth a shallow pit house built over one of the storage units.

One of the deep pit houses had a ventilator which opened into an antechamber that may have been added as a later feature of the house. The ventilator opening was closed with a sandstone slab. Two of the other deep structures had wing-walls, clay floor ridges, and a rock-filled oven (Fig. 4). These were the only structures in which either wing-walls or clay floor ridges were found. One other deep structure had a rock-filled oven. Four of these pit houses had deflectors. All of the pit houses had circular fire pits located in the center or between the center and the ventilator side of the houses. These fire pits were either clay-rimmed or slab-lined, except in one instance in which the fire pit was both slab-lined and clay-rimmed.

Only two of the pit houses had benches. In one instance the benches were on the forward portion of each of the side walls, toward the front of the house. In the second instance one of the benches occupied this same relative position, but the other was in the opposite back corner of the house. The deep pit houses were square to rectangular with rounded corners, with the exception of the deepest which was circular in outline. They were dug into a hard sterile red

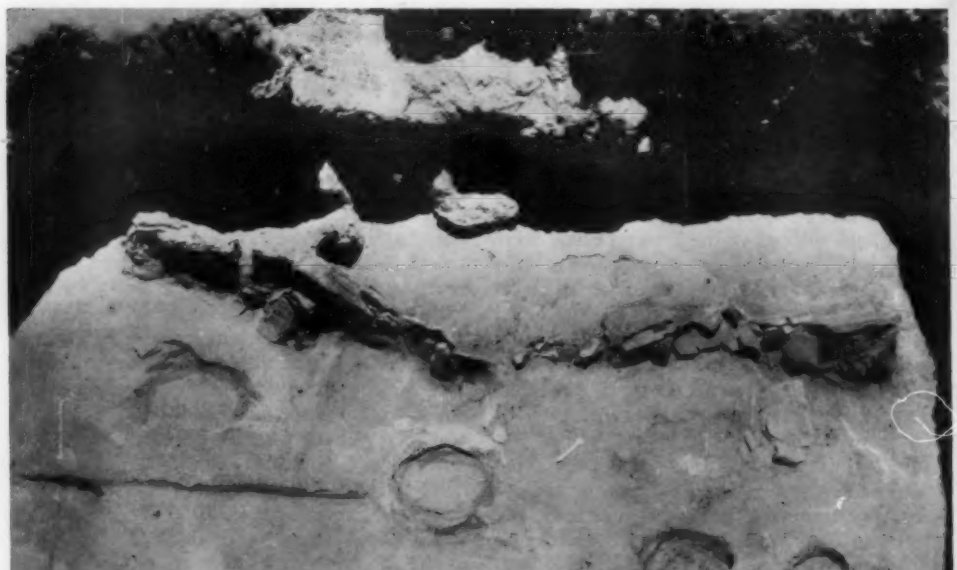

Fig. 4. White Mound phase pit house. Ariz. K:12:8, Structure 3; length 5:5 m., depth 2.2 m.

sand to a depth of from 0.9 to 2.0 m. Two of these structures were also excavated partly into mixed trash and sand. Both of the deep pit houses with wing walls and clay floor ridges were heavily burned and provided all of the tree-ring specimens and charred perishable material from this site. None of the other excavated structures was burned.

Perishable materials, preserved in charred form, have not yet been analyzed. They consist of several sandal fragments, a few basketry fragments, a jar full of prickly pear cactus leaves, a quantity of shucked corn in a seed jar, several collections of corn cobs and shucked corn, and a piece of wooden weaving tool.

A Pueblo II occupation of this area was represented by a small Wingate phase pueblo about 75 m. to the north of the excavated White Mound phase structures. This pueblo had been completely dug through by previous owners of the Three Hogans Trading Post. Sherds from this Pueblo II occupation were encountered in the upper fill of most of the White Mound phase structures, and seven burials attributed to this later occupation of the site on the basis of associated funerary pottery were made in the fill of some of the White Mound phase structures. These were adult burials placed on the right side with legs flexed and with from one to five (usually three) offertory vessels. No predominant pattern of cardinal orientation was represented by this group of burials. Two of the burials were apparently accompanied by turkey burials, and one of these two also had a dog burial.

Because of the marked differences in the ceramic products of these two periods (the White Mound phase of Basketmaker III and the Wingate phase of Pueblo II), there was no problem in identifying the general material that belonged to each. At White Mound Village, on the other hand, the ceramic and architectural picture of the White Mound phase was complicated by a Pueblo I occupation of the village, and it is not at all clear from Gladwin's report whether the White Mound phase ceramic complex included any of the Pueblo I pottery types discussed (Gladwin 1945: 22–6). Excavation in the relatively "pure" White Mound phase horizon at Ariz. K:12:8 revealed that the ceramic complex consisted predominantly of White Mound Black-on-white and Lino Gray. There was not a single sherd of Kana-a Gray, Kiatuthlanna Black-on-white, Kana-a Black-on-white, or any of the Pueblo I black-on-reds. If one may anticipate the results of the tree-ring analysis, it can be suggested that the village at Ariz. K:12:8 was occupied entirely during the White Mound phase and that this occupation was therefore somewhat earlier than that at White Mound Village, which apparently lasted into the Kiatuthlanna phase of Pueblo I.

EARLY PUEBLO II

Red Mesa Phase

Components of the Red Mesa phase were excavated at four different sites of this salvage project. At Ariz. K:12:9 (T22N, R31E, Sec. 18, about 3.5 miles southwest of Lupton in the new west-bound roadway) a two-room house was all that was found. The existing highway cut undoubtedly removed much of the site.

In Pueblo Unit 2 at Ariz. K:12:6 five rooms were excavated and an associated kiva was outlined but was not completely excavated. Ariz. K:12:10 provided two rooms that have been assigned to the Red Mesa phase. Four other excavated rooms may have been occupied during either the Red Mesa or Wingate phases; the architecture was non-distinctive, and the sherd sample was inadequate for making a more definite phase assignment.

At Ariz. K:12:7 (T22N, R31E, Sec. 5, about 1.6 miles southwest of Lupton in Material Pit No. 2 of the highway project) five rooms, a kiva, a trash mound, and three burials were excavated. The kiva was a simple circular structure without benches or a southern recess. Of particular interest was the facing to the horizontal portion of the ventilator shaft (Fig. 5). This consisted of a sandstone slab 35 cm. wide and 70 cm. high set into the masonry construction of the wall. The ventilator opening was a hole 25 cm. wide and 30 cm. high pecked through the slab. Wall plaster was preserved around much of the circumference of this kiva, and in some areas as many as nine layers were counted. They varied somewhat in color, but there was no evidence of painting on any of the surfaces of these plaster coatings.

In contrast with the kiva just described, the Red Mesa phase kiva at Pueblo Unit 2 in Ariz. K:12:6 had a keyhole shape with a southern recess and a bench around the front half of the structure. There was no evidence of plaster.

Red Mesa phase architecture characteristically is variable. Although coursed stone ma-

Fig. 5. Red Mesa phase kiva. Ariz. K:12:7; diameter 4 m., depth 1.5 m.

sonry techniques were known and were employed in the construction of some surface rooms and most kivas in a fairly skilled manner, most of the domestic structures were more crudely built, and very often much more mud than stone was used in wall construction. For this reason it is not unusual for the excavator to be unable to find one or two walls of some rooms, or to be unable to find any trace of other rooms. Contributing to this situation is the fact that floors were seldom given special preparation. Often they have to be interpolated with reference to specific floor features. It is probable that each of the Red Mesa phase pueblos excavated at Ariz. K:12:6 and Ariz. K:12:7 had three or four more rooms than were revealed by excavation.

More detailed reporting of the excavations representing the Red Mesa phase are omitted because details do not differ significantly from those in the published literature (Roberts 1939, 1940; Gladwin 1945; Olson and Wasley 1956c).

Late Pueblo II

Wingate Phase

Wingate phase pueblos were excavated at Ariz. K:12:5 (T22N, R31E, Sec. 4, about 0.75 miles southwest of Lupton near the junction of the St. Michaels road with Highway 66 in the west-bound roadway and approach road of the new highway construction), and at Pueblo Units 1 and 3 at Ariz. K:12:6. In addition, five excavated structures, including two kivas, at Ariz. K:12:10 were also assigned to the Wingate phase.

The kivas at Ariz. K:12:5 (Fig. 6) and at Pueblo Unit 1 in Ariz. K:12:6 were keyhole shaped. Not enough of the kiva at Pueblo Unit 3 in Ariz. K:12:6 was revealed by excavation to determine whether it was circular or keyhole shaped, but it was probably one or the other. One of the kivas assigned to the Wingate phase at Ariz. K:12:10 was circular without a bench or southern recess, while the other was essentially rectangular with rounded corners and had a southern recess and a bench along one side only.

In the Wingate phase kiva excavated at Ariz. K:12:5 the walls below the bench level were plastered with 11 coats of apparently unpainted plaster. This kiva had two ventilator openings, one through a subfloor duct and the other in the face of the southern recess or altar. Roberts (1939, Pl. 26 *b*) illustrates this same arrangement in a kiva at the Allantown ruins (Fig.

1), which may also be assigned to the Wingate phase. In the kiva at Ariz. K:12:5 the above-floor ventilator was blocked off with a sandstone slab (*i* in Section BB′ of Fig. 6). Thus, the subfloor ventilator was the only one in use at the time the kiva was abandoned.

Examination of the altar and ventilator construction suggested that the subfloor ventilator was built first and that the above-floor ventilator was added later. Lending support to this conclusion is the statement by Judd (1959: 59), that "An above-floor ventilator in Chaco Can-

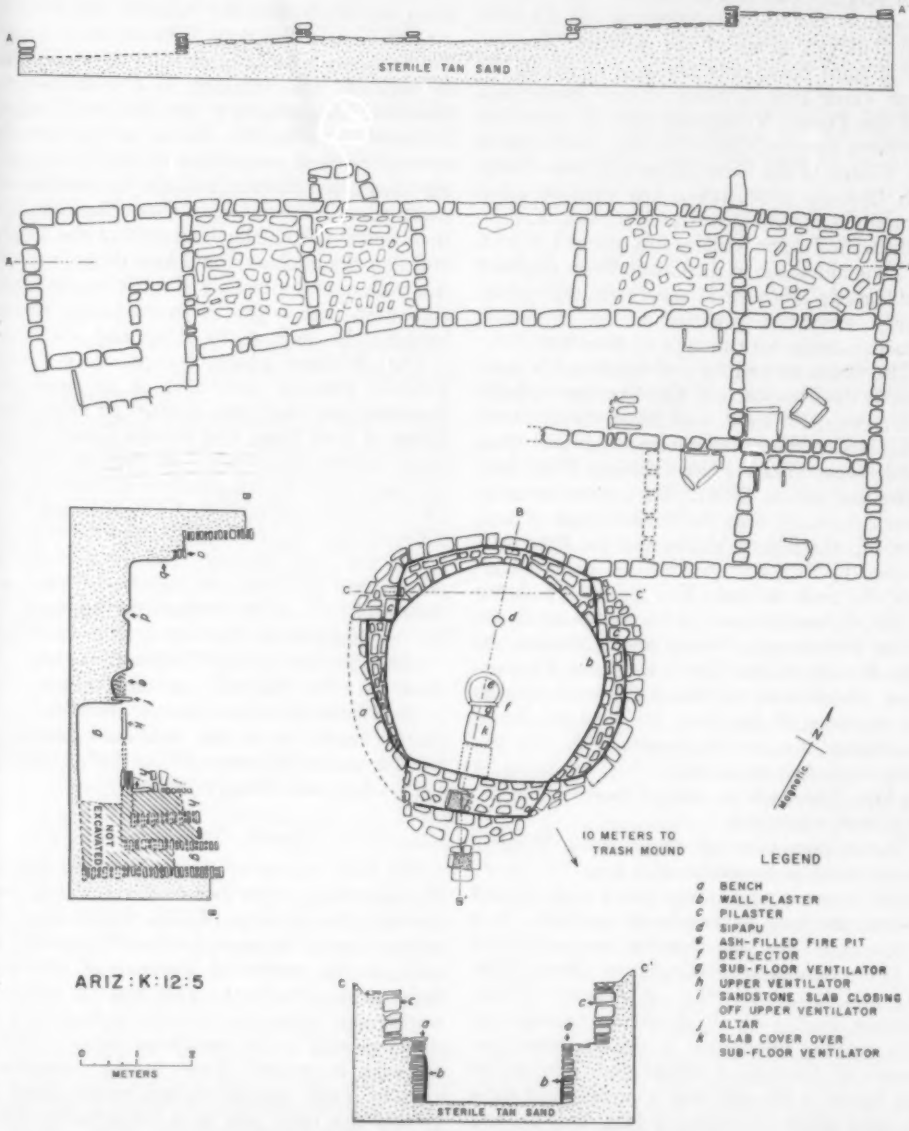

Fig. 6. Plan and sections of Wingate phase pueblo.

yon is invariably evidence of reconstruction." Although the above-floor ventilator in the kiva at Ariz. K:12:5 was the last to be built, it was the first to be abandoned, suggesting a decided preference for the subfloor type of ventilator.

Judd (1959: 27, 59) also remarks that the Chaco type kiva typically employs the subfloor ventilator duct. The subfloor type of ventilator does not seem to occur in the Kayenta and Tusayan areas of the western Anasazi, and it must occur only rarely, if at all, in the Mesa Verde area. Outside of the Chaco Basin and the Puerco Valley this type of ventilator has been reported only from the Zuni area at the Village of the Great Kivas and near Hawikuh (Roberts 1939: 214). The subfloor ventilator ducts at Allantown and at Ariz. K:12:5, both in the Puerco Valley, and one at LA 2505 on Tohatchi Wash in the Chaco Basin (Bullard and Cassidy 1956: 44–5) seem to be the earliest known examples, pointing to an essentially Chacoan origin for this type of ventilator.

The above-ground type of ventilator is common in the Tusayan and Kayenta areas (Haury 1931; Beals, Brainerd, and Smith 1945; Smith 1952) and in the southeastern Utah and Mesa Verde areas (Brew 1946; O'Bryan 1950; Lancaster and others 1954). They seem to occur more commonly than the subfloor type of ventilator in the Puerco Valley and the Zuni area.

Ariz. K:12:5 was an 11-room pueblo with kiva and trash mound. The latter (not shown in Fig. 6) was located 12 m. to the southeast of the kiva fire pit. It was not excavated. At Ariz. K:12:6, Pueblo Unit 1 consisted of a nine-room pueblo with its kiva and a trash area to the southeast of the kiva. Pueblo Unit 3 also represented a nine-room pueblo with kiva and trash mound located about 10 m. southeast of the kiva. The trash mounds of these two pueblo units were excavated.

The village plan of these three Wingate phase pueblos, consisting of a kiva "in front" of the domestic pueblo unit and a trash mound beyond the kiva, is remarkably uniform. It is a type of village plan that has been described as front-oriented or unidirectional (Reed 1956: 16) and is characteristic of Anasazi villages through Pueblo III. It should be pointed out that cardinal orientation is not the important feature of this type of village plan. The key to this layout is the fact that a pueblo unit faces an open plaza containing a kiva, and beyond the plaza area, in the same general direction as the line of the pueblo and kiva, the trash mound was established. The particular cardinal orientation of these three pueblos, a general southeasterly direction, can be accounted for in terms of the local topography and choice of site location. In this small area of the valley of the Puerco River, the valley trends in a general southwesterly direction, while its tributaries from the north cross the valley to the river in a southeasterly direction. Between these lateral drainages are a series of parallel ridges of sand or bedrock, also trending in a southeasterly direction. Apparently it was the sand ridges, in particular, that the Anasazi of the periods covered by these excavations preferred (excluding the Pueblo III farm house). In building on these ridges, it seems logical that village orientation would follow the long axis of the ridges and that the pueblos would look directly across the valley, and probably directly across their cultivated fields which lay in the valley bottom between the ends of the ridges and the river.

The Wingate phase occupation at Ariz. K:12:10 presents something of an anomaly. Domestic structures were isolated pit units, consisting of both living and storage rooms. They were square, rectangular, or oval in outline and apparently incorporated no masonry at all. One of these structures had a hearth, ash box, deflector, and metate bins. Except for the two kivas, the only masonry construction represented was in a subterranean beehive-shaped storage cist 60 cm. in diameter at the base, 35 cm. in diameter at the top, and 8 cm. high.

Other features of the Wingate phase excavations on this highway salvage project are omitted from this report because they duplicate details appearing in the published literature for this period (Roberts 1939, 1940; Gladwin 1945; Olson and Wasley 1956c).

Early Pueblo III

The only excavation representing the Pueblo III occupation of the Puerco River Valley was that at Ariz. K:12:4 (T23N, R31E, Sec. 33, back of Lupton between Lupton Wash and the cliffs, in the eastbound roadway of the new highway construction). This was an isolated, single-room structure, probably a farm house, that was built on the sandstone bedrock which outcrops in several places in the immediate vicinity. Little deposition had accumulated to protect this ruin, and as a consequence little was left to excavate and record. There was a

slight indication that there may have been a second room in this unit, but even that is not certain. The room contained a slab-lined hearth, roughly square in outline, in one corner. Although little of the masonry construction was preserved, it appeared to be singularly crude. Most of the Pueblo III villages in the Puerco Valley lie farther away from the river and beyond the area of the salvage project.

DISCUSSION

Between May 11 and June 10, 1959, salvage archaeology was conducted in 10 ruins along a new alignment of U.S. Highway 66 (Interstate 40) near Lupton, Arizona. Individual units excavated include the following: 16 pit houses, 43 surface rooms, 7 kivas (two of them partially excavated), 6 trash deposits, 18 burials, and 21 miscellaneous architectural features such as storage pits and cists. A total of 154 tree-ring specimens were preserved. This work was accomplished with three archaeologists, a maximum crew of 30 Navajo laborers, and the use of heavy equipment.

As a result of this intensive excavation thousands of potsherds were collected, perhaps two or three dozen whole and restorable vessels, scores of artifacts (although milling stones, handstones, hammerstones, and other heavy stone artifacts were recorded in the field and left there), quantities of charred corn, corn cobs, and other plant remains. Nearly as much material and data were recovered as would have been possible under more leisurely excavation conditions. The gathering of such a large volume of objects and information in a thirty-day salvage operation created a new problem. How is the material to be analyzed and the results made public?

As a rule salvage contracts do not, as this one did not, make any or adequate provisions for proper analysis and preparation of a complete report. Most institutions participating in archaeological salvage projects, particularly this type which arises on the spur of the moment, are not in a position to employ additional personnel to accomplish these tasks, especially when the job assumes this magnitude.

A preliminary statement in an article such as this may provide part of the answer, but the greater part of the problem remains. Before seeking some satisfactory solution for this dilemma, it will be well to see what the preliminary statement has tried to accomplish. The nature of the salvage project and the results in very broad terms have been presented. Details (except where future artifact analysis may provide others) have been given only where additions or modifications have been made to the archaeological knowledge of the area. These may be summarized briefly as follows:

1. Recognition of Mogollon culture bearers apparently living side by side with Anasazi during the early part of Basketmaker III in the Lupton area. This was based on the evidence from the pit house village at Ariz. K:12:6, which has been tentatively assigned to a new Lupton phase.

2. Clarification of the definition of the White Mound phase on the basis of excavation at Ariz. K:12:8.

3. The use of a perforated slab for a ventilator opening in a Red Mesa phase kiva at Ariz. K:12:7.

4. The occasional use of two ventilators in Wingate phase kivas: the above-floor ventilator and the ventilator with a subfloor duct.

5. The definition of a specific village plan for the Wingate phase: a unidirectional layout consisting of a pueblo unit, a kiva and plaza, and a trash mound.

6. The occasional use of domestic pit structures without masonry construction in the Wingate phase, exhibited at Ariz. K:12:10. Illustrations have been used sparingly, but an attempt has been made to present by picture or plan the range of the architecture discussed and the special features encountered.

This leaves for the future the presentation of the artifact analysis, a more complete description of the architecture, and the integration and interpretation of the completed project. While this might be possible with outside financing, it might also be accomplished by graduate students at the University of Arizona, working on research projects for credit. Making the results of these projects available could be accomplished by Microcard publication in the Society for American Archaeology series, *Archives of Archaeology*, or through publication in the regional journals. With two other highway salvage projects in this same general area on the horizon, the combined results of the three projects might provide the basis for a doctoral dissertation.

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Tucson, Ariz.
December, 1959

AN EDEN-SCOTTSBLUFF BURIAL IN NORTHEASTERN WISCONSIN

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ABSTRACT

In 1959 the Neville Public Museum, Green Bay, Wisconsin, discovered and excavated a cremation burial site near the base of the Door Peninsula in northeastern Wisconsin. Associated with the cremated remains of a human being were fire-cracked rocks, the fire-shattered fragments of large quartzite bifacial implements, and projectile points of Eden and Scottsbluff types. A possible Turin type of side-notched flint projectile point was also in association. The site is on the crest of a fossil beach equatable with the Main Algonquin lake stage of the Green Bay–Lake Michigan basins, thus establishing a maximum possible age for the cultural features. That the artifacts and burial are post-Lake Algonquin by not more than about 2500 years is indicated by typological comparisons of the artifacts with radiocarbon-dated assemblages in the High Plains, usually regarded as the center of the Eden-Scottsbluff complex. An age of 6500 to 4000 B.C. is suggested for the burial.

DURING THE SUMMER of 1959, the Neville Public Museum, Green Bay, Wisconsin, excavated a small Eden-Scottsbluff burial site in the area of Red Banks near the southeastern shore of Green Bay near the base of the Door Peninsula. A portion of this same area is identified on some maps as Point Comfort. This site, owned by Paul Renier of Red Banks, is in the S.E. ¼ of the N.E. ¼ of Section 29, Twp. 25 N., Range 22 E., Town of Scott, Brown County, Wisconsin (Fig. 1). The locale is included in the U.S.G.S. topographic map series, New Franken Quadrangle.

The Renier site (pronounced Ren'yer) is located on the crest of a long sand-covered ridge that runs parallel to the Nicolet Road for almost a quarter of a mile. The shore of Green Bay is at present only 1500 feet away, and the ridge itself is one of several fossil beaches observable in this region. Parts of the lowest extent of the ridge are presently under cultivation, but the major portion has never been plowed and has always been used as pasture land. Vegetation is sparse all along the ridge except for a few trees on the flanks and crest; the humus even today is very thin, and the sandy ridge cover is apparently a fairly recently (geologically) stabilized feature.

Throughout Red Banks, occasional finds of Indian materials have been made on the surface and from plowed fields, and there is a popular tradition of extensive Indian occupation in early historic times. Part of this tradition, perhaps, is ascribable to the close proximity of the spot where Jean Nicolet, the discoverer of Green Bay, encountered what were probably Winnebagos in 1634 although, judging from some of the finds made here, occupation by Indian groups extended over a long period of time. This region was thoroughly collected by J. P. Schumacher in the early 20th century, but no materials comparable to those from the Renier site are present in his large collection, now in the Neville Public Museum.

During a survey made in this area in the early summer of 1959, the sand-mantled ridge was examined for surface indications, but none were found except for a single recent projectile point and a few flint chips from the bay side of the ridge. On the basis of topography alone, it was decided to test the highest part of the ridge to determine if any cultural materials were present below the surface.

EXCAVATIONS

The first test pit was in an occupation area on the highest point on the ridge. Tests elsewhere along the ridge produced nothing beyond some scattered flint chips, and excavation was thereafter confined to this first area. Method of excavation was to dig and screen thoroughly material from 5-by-5-foot pits added in all directions to the original test pit, which proved to have been made in the exact center of the very restricted artifact-bearing area. No stratification was observable in the ridge, undifferentiated sand being present down to beach gravel. Artifacts were extremely scarce and occurred anywhere from 1 foot to nearly 4 feet below the surface but in most cases concentrated at 2 to 3 feet. In all cases pits were taken down to absolutely sterile sand, and the excavation area itself was extended out to similarly sterile sand on all sides of the small cremation site.

Before any extensive work was carried out at the Renier site, the area was surveyed with transit, rod, and steel tape. The sand-covered ridge and the immediately surrounding area were mapped, and the elevation of the top of the ridge above the present level of Green Bay was determined.

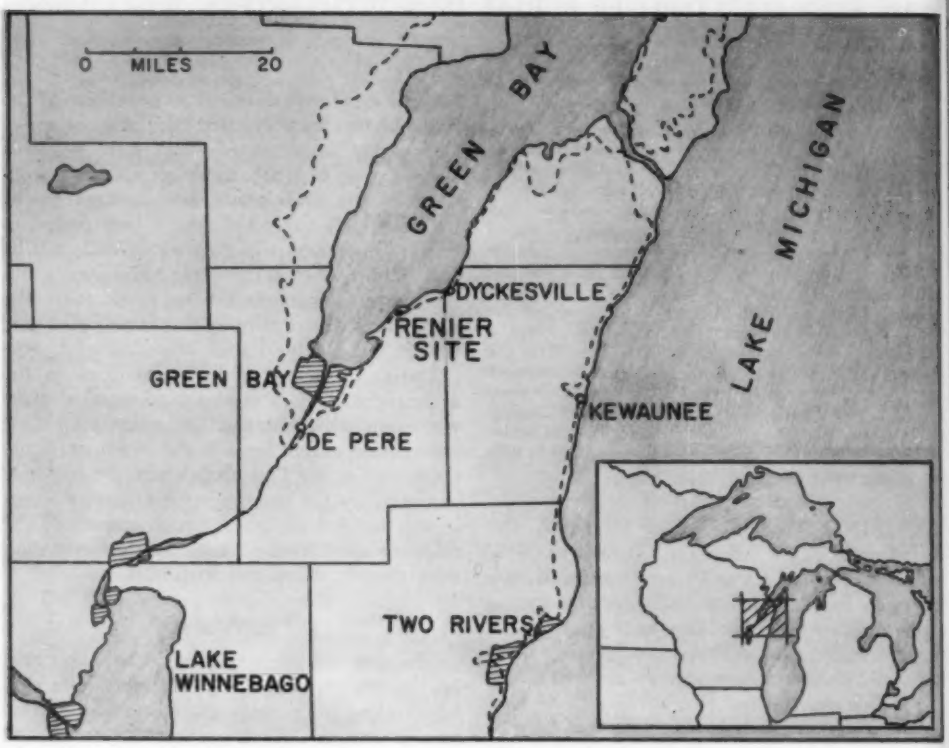

Fig. 1. Reference map showing the location of the Renier site and other localities mentioned in the text. Hachured areas represent major municipalities. The broken lines indicate the maximum extent of Lake Algonquin. The shoreline of Lake Algonquin is taken from Goldthwait (1907, Pl. 4), Thwaites (1943, Pl. 10), and Thwaites and Bertrand (1957, Pl. 8).

Subsurface exploration revealed scattered but unmistakable evidence of a small crematorium —a cultural feature reconstructed from numerous fire-cracked rocks, fragments of cremated human bone, and fire-fractured artifacts. The artifacts were broken in a manner possible only by strong thermal action; circular breakage and minute fragmentation, in addition to fire-spalling (or potlidding) on the flint artifacts, indicate fire-breakage that was confirmed by the other signs of fire: fire-cracked rocks and associated calcined bone. The small quantity of bone fragments recovered (too small, unfortunately, for radiocarbon dating) suggests a single individual whose sex and exact age at death cannot be determined. It appears, then, that a corpse accompanied by grave offerings (perhaps personal possessions) was placed on a shallow bed of rocks or in a shallow rock-lined pit (for which evidence did not survive) and was then cremated in an intense fire.

All of the artifacts, fire-cracked rocks, calcined bone fragments, and other traces of the small crematorium and its contents were scattered vertically 1 to 4 feet beneath the present surface and, horizontally, within an area of about 250 square feet. Flecks of charcoal were frequently encountered, but most of these could be attributed to the burning of tree stumps when the land was originally cleared for pasture. Flint chips occurred sporadically in the cremation area and were found in most of the test pits as well as on the surface as described above. None of these chips are of the same material as the artifacts from the cremation, and none exhibit any signs of having been exposed to fire; it is evident that they relate to another, probably later, occupation whose affinities cannot be determined.

The vertical and horizontal scattering of cultural remains seems adequately to be explained by natural causes operative over probably thousands of years. The principal agency was undoubtedly wind action which, on an elevated, exposed sandy surface, can rapidly scatter and bury objects to varying depths. Animal burrows were encountered by the dozen, and ground squirrels abound in this region today. Activities by these burrowers and disturbance by tree roots doubtless contributed materially to the destruction of a once-tight locus of fire-altered rocks, bones, and artifacts.

HUMAN REMAINS

Because the bones are so badly fragmented and are fully calcined, little can be said regarding them. The material was examined by Charles E. Eyman, Laboratory of Physical Anthropology, University of Michigan, who was kind enough to submit the following observations:

> With a reasonable amount of certainty I can tell you this about the material: (1) There are several identifiable cranial fragments and their relative thinness suggests a young individual. Since I was not able to identify the particular sutures on some of them, age cannot be estimated except to say that there seems to be no obliteration of sutures. As to the position of these fragments on the cranium, a few are probably from the frontal or occipital. (2) Two or three fragments are identifiable as mandibular, possibly palatal, components. In all cases these are from the lingual surface of the jaws and are alveolar fragments. One such piece seems to belong to the canine-incisor region. The alveolar socket sizes suggest a young individual, possibly an adult but more probably an adolescent. One tooth fragment is either a canine or incisor and its gracile size is more probably attributable to a youth rather than to a small female. (3) In regard to the remaining fragments, they constitute various bones of the postcranial skeleton. I do not want to venture a guess as to exact bones, but some fragments may well be from the humerus or possibly the femur. The majority of the scraps are probably from the distal components of the extremities. One bone is either a bird long bone or a phalanx from a youngster.
>
> From the above I cannot determine sex, and of course a statement about the exact age of this individual at death is also impossible. I do lean towards interpreting the material as adolescent rather than a slightly-built female who is a young adult. I believe that thickness of the cranial sutures, and the small size of the tooth sockets reinforce this interpretation.

EDEN AND SCOTTSBLUFF PROJECTILE POINTS

From the fragments found in the sand-covered ridge, it was possible to recognize 12 projectile points, ten of which proved to be reconstructable. In addition to these 12, a small number of fragments (including tips, bases, and blade sections) may represent parts of still other points. All of the projectile points are characterized by fine flaking that ranges from collateral to oblique transverse. Specimens manufactured by the latter technique exhibit flake scars that sometimes extend almost entirely across the face of the artifact. As a rule, the primary transverse flake scars are long and parallel-sided except for the conchoidal scars of the two collaterally-flaked points. Since quartzite absorbs rather than reflects light waves, the photographs of the Renier specimens in this report do not do justice to their very fine workmanship. One of the projectile points (Fig. 2 c) combines flat transverse flaking on one face with deep collateral flaking on the other; this interesting specimen cements the intimate association of the oblique transverse and the collateral flaking techniques already apparent at this site. Fine edge retouch is beautifully executed, and all of the preserved lateral and basal edges of the stems are heavily ground. The total configuration of blade shape, flaking pattern and execution, and edge treatment is distinctly paleo-Indian and, specifically, Eden and Scottsbluff. Descriptive metrical data on the ten reconstructable points are in Table 1. These points are illustrated in Figures 2 and 3.

The fragmentary projectile points were reconstructed by means of measurement ratios (W–L and T–W indices) for the Finley site Eden and Scottsbluff points presented by Satterthwaite (1957) and by means of a third ratio or index (S–L index) which we developed from his metrical data. The pertinent descriptions of the Finley site points are given by Satterthwaite (1957, Table 2). The points from the Finley site were used because it is the only Eden-Scottsbluff station with a large enough sample that has been adequately described.

The W–L index presents the relationship of width and blade length of a projectile point in percentage form; the index expresses what percent (to the nearest whole number, decimal points ignored) the width of the blade is to the length of the blade. Likewise, the T–W and the S–L indices express what percent the thickness of the blade is to its width, and the stem length is to blade length, respectively. Thus, to obtain the T–W index of a blade 9 mm. thick and 2.7 cm. wide, the thickness is divided by width, and the resulting percentage (33) is the index. By thus avoiding tedious

TABLE 1. METRICAL DATA ON THE PROJECTILE POINTS FROM THE RENIER SITE.

The specimens are arranged to reflect the classification and to bring the most similar points together as measured by the W–L and T–W indices. Measurements are in millimeters. An asterisk (*) indicates the dimension is reconstructed from the W–L and S–L index ratios except in the case of Figure 3 *e*. This specimen was reconstructed by projection from the curved edge and on the assumption of bilateral symmetry. Figure 2 *c* is tentatively classified as Scottsbluff Type I, despite a blade configuration suggestive of Scottsbluff Variant, because the blade length calculated from the W–L index for Scottsbluff Type I agrees within 1 mm. of the observed blade length. That it may actually be transitional between these two types may be seen by comparing the pertinent S–L indices.

		Indices			Blade			Stem	Total
Figure	*Type*	*W–L*	*T–W*	*S–L*	*Length*	*Width*	*Thickness*	*Length*	*Length*
2 *a*	Eden	20	42	14	130*	26	11	18*	148*
2 *b*	Eden	20	35	14	130*	26	9	18*	148*
2 *c*	Scottsbluff Type I?	31	39	17	97	30.5	12	17*	114*
2 *d*	Scottsbluff Type I	32	32	21	87*	28	9	18.5	105.5*
2 *e*	Scottsbluff Type I	32	28	20	112*	36	10	23	135*
3 *a*	Scottsbluff Type I	32	26	18	125*	40	10.5	22*	147*
3 *b*	Scottsbluff Type I	32	26	18	131*	42	11	24	155*
3 *c*	Scottsbluff Type I	32	25	18	114*	36.5	9	21	135*
3 *d*	Scottsbluff Variant	37	24	16	100*	37	9	16*	116*
3 *e*	Scottsbluff Type II	51	20	22	78*	40	8	17	95*

comparisons of absolute measurements, it is easy to group sets of similar points.

For each of Satterthwaite's point categories (such as Eden Collateral, Scottsbluff) the average and the standard deviation about the mean were calculated for the three indices W–L, T–W, and S–L. This supplied us with metrical proportions within known standard errors for the reconstruction of our specimens, thought typologically to be similar. Using the averages thus calculated and in conjunction with the measurements we could obtain directly by observation, it was possible to construct equations, supplying the missing terms by calculation with one unknown. Because of compatibility with most reconstructions made by projecting preserved blade edges and based on the assumption of bilateral symmetry, it is believed that these reconstructions are reasonably accurate to within the standard deviations calculated. A test of this hypothesis was afforded in the case of the point in Figure 2 *c* (the only specimen with a complete blade). The blade length calculated from the average W–L index was 9.6 cm. The observed blade length is 9.7 cm.

The greatest amount of reconstruction required was in the case of the two Eden points (Fig. 2 *a*, *b*). These were typed as Eden points because of collateral flaking and resultant median ridges, straight edges, and the high T–W indices reflecting the thick, narrow blade characteristic of Eden points. The average T–W index for the Renier site Eden points falls within 0.7% of the average T–W index minus 1 standard deviation for the Eden Collateral points from the Finley site (42 ± 2.8). The reconstructed stems are so drawn because this is the only type of stem known for Eden points at the Finley site. The stem lengths were obtained by calculation from the S–L index.

Of the two projectile points not included in the table, one is the partial mid-section of a thick Scottsbluff blade which was not complete enough for measurement. The other, represented by most of one edge and part of the mid-section, is a Scottsbluff point of gray and yellow mottled flint. This point is similar to the others in type and fineness of execution, but was so shattered that measurements from the restored

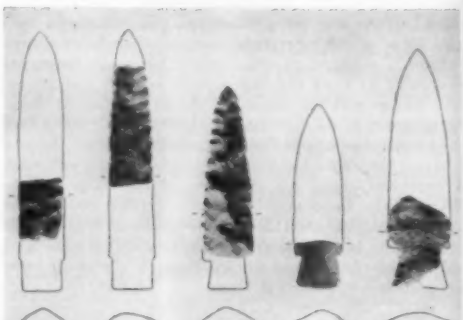

FIG. 2. Reconstructed Eden and Scottsbluff points from the Renier site. *a*, *b*, Eden points; *c–e*, Scottsbluff points.

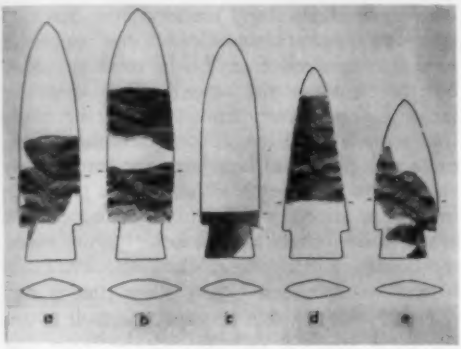

FIG. 3. Reconstructed Scottsbluff points from the Renier site.

pieces are likely to be inaccurate. Except for this last example, all the points were made of high grade quartzite that ranged in color from cream and tan to dark gray. The fineness of execution of these projectile points is doubly impressive considering that the raw material was almost entirely quartzite.

SIDE-NOTCHED POINT

The only non-Scottsbluff or Eden point from the Renier site is the base of a lanceolate side-notched point (Fig. 4 *f*) which resembles side-notched points from Graham Cave and the familiar Black Sands point of the Midwest. This base, which consists of four separate pieces, is broken and fire-fractured in the same manner as the other artifacts found in the sand-covered ridge. Fire spalls are present on the base and on two of five other sections of what is probably the same projectile point. The base and the blade fragments are made of a dull black flint that in no way resembles the single other flint point found here. The base and side notches of the point are ground smooth, and the surviving edge section is very finely serrated; what remains of the blade is broadly flaked and well made although it is almost crude in comparison to the other Renier site artifacts. All the pieces of this side-notched point were found with the other material in the same small area and similarly scattered throughout the sand.

The presence of the side-notched point in the otherwise Scottsbluff assemblage strongly suggests contemporaneity and establishes as bedfellows two projectile point types which do not usually occur together. The sharp difference in material and flaking technique as well as the fact that only a single example was found could indicate that the side-notched point was an intrusion and does not actually belong with the other material at all. The type of breakage, however, means that all the points from the ridge were broken in the same way, and lacking evidence of any possible natural agency, it must be assumed that they were all broken together, in the same fire that served to cremate the individual whose remains were found in the top of the ridge. Further supporting the contemporaneity of the two point types are other very early occurrences of similar side-notched points; they occur in the bottom levels of Graham Cave together with a Scottsbluff Type I point (Logan 1952: 32, 34, Pl. 6 G); a smaller example was found in New York below Lamoka material at the Lotus Point site (Ritchie 1958: 34); and a similar point was present in one of the early levels at Sheguiandah, Manitoulin Island, Ontario (Lee 1955: 63, Fig. 30, *7*). An early time horizon for similar points is also suggested at Modoc Rock Shelter, Illinois (Fowler and Winters 1956). Side-notched projectile points of smaller size were found at the Simonsen site in western Iowa in association with extinct bison (*Bison occidentalis*), and one other was with the Turin burials. The Simonsen and Turin points differ from the Renier side-notched point in that they are smaller and have concave bases and more shallow side-notches. Otherwise they are quite similar, and the most recently excavated specimen from the Simonsen bison quarry has a straighter base and the deeper side-notches characteristic of the Renier specimen (Agogino and Frankforter 1960). The Simonsen site has been radiocarbon-dated at 6471 B.C. (8430± 520 B.P.). In Wisconsin, similar points are reported associated with Old Copper at the Osceola site (Ritzenthaler 1957, Pl. 6) but not at the Oconto site dated earlier by radiocarbon (Wittry and Ritzenthaler 1957: 320–1). Side-notched points of strikingly similar characteristics have apparently had a long career in the eastern United States (Wittry 1959: 44) and seem to have been coeval not only with peoples of a strictly Archaic way of life but also with paleo-Indian hunters of big game.

We believe the evidence is sufficient to warrant considering the side-notched point and the Eden-Scottsbluff quartzite points as contem-

poraneous and definitely associated in the burial activity recorded at the site. We do not believe, however, that the two projectile point traditions are directly related or that the two radically different kinds of points were made by members of the same group — they are too clearly separated in the contexts of shape and flaking technique. For this reason we believe that some sort of culture-contact, rather than developmental, situation is represented, one between Archaic and paleo-Indian traditions.

Bifacial Blades

In addition to the points, many fragments of what are apparently large bifacial blades of quartzite (Fig. 4 *a-c, g-i*) and (in one instance) flint were found scattered in the sand in the crematory area. Out of the large number of fragments, eight blades could be restored sufficiently to tell something about their size and shape. Generally, they were long and ovate with squared bases and rounded tips. Since no complete specimens were found, it is impossible to give exact sizes of any of the original blades, but the estimated size range is 10 to 15 cm. in length. Workmanship on some of the blade fragments is excellent, approaching that of the projectile points, although two comparatively crude examples are present. Some of the blade fragments are very thin in cross section (11 mm.) while others are thicker (17 mm.) and more massive throughout. The single flint blade is of a worn, powdery gray chert that is represented only by this one specimen. It is not the same material as either of the other flint artifacts of the Scottsbluff group nor is it similar to the flint flakes found in the ridge.

Blades quite similar to these (except for workmanship) were found at Lime Creek (Schultz and Frankforter 1948, Fig. 8), at the MacHaffie site (Forbis and Sperry 1952: 129), and may be present at the Horner site. Jepsen

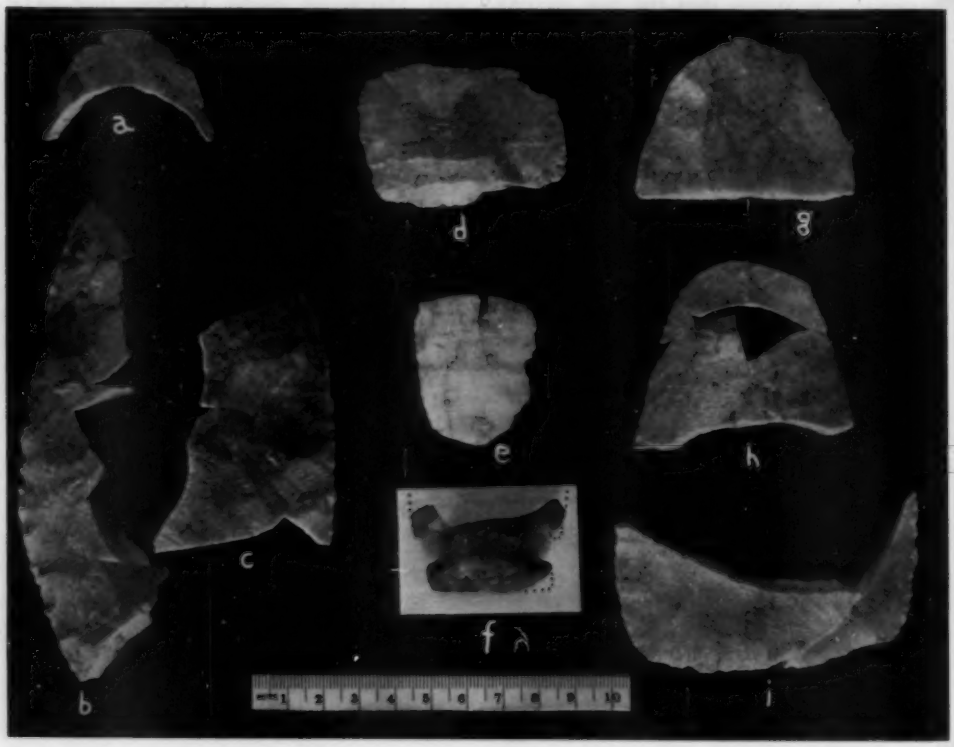

Fig. 4. Miscellaneous artifacts from the Renier site. *a–c, g–i,* fire-cracked fragments of quartzite bifacial blades; *d,* flint scraper; *e,* quartz scraper; *f,* side-notched point of flint.

(1951: 24) mentions both "chopper" and "axes," either of which could refer to this kind of large blade. The Renier site blades do not closely resemble the large quartzite tools from George Lake (Greenman and Stanley 1942; Greenman 1943).

Unfortunately, we have no clear idea as to the functions of these bifacial blades. While we are ignorant of their function, we would question their identifications as blanks because of the relative fineness of their workmanship and their carefully trimmed and retouched edges. "Choppers," in the Archaic sense, seem likewise precluded. It may well be, however, that these artifacts are indeed blanks and that the aesthetics discernible in the treatment of the projectile points were also extended to the treatment of potential tools, that is, blanks.

SCRAPERS

Other than projectile points and the big bifacial blades, there were two scrapers found. The first of these (Fig. 4 *d*) is the only nearly complete artifact from the site, and it, too, was broken on two edges. This ribbon-flaked scraper is of light blue and yellow mottled flint similar to the single flint Scottsbluff point. It is a rectangular side-and-end-scraper (4.0 by 5.7 cm.) and has one very steeply beveled working edge; flake scars are exceptionally long and thin, and workmanship is excellent. Although it is broken, this scraper does not exhibit any fire-spalling or other evidence of having been in the cremation. Because of the type of flint and the workmanship, it must be included with the Scottsbluff assemblage, but not necessarily with the cremation burial. The other scraper (Fig. 4 *e*) is a beveled end-scraper of fire-broken and spalled milky quartz (4.3 by 3.4 cm.). It is based on a flake whose bulbar end is at the proximal end of the scraper. Milky white quartz is rare at the Renier site, this being the only instance of it among all the artifacts found. Both of these scrapers seem to have been finished for hafting.

RELATIONSHIP TO GEOLOGICAL FEATURES

The cultural features at the Renier site can be geologically dated to the extent of determining the site's maximum possible age and, thus, the maximum permissible age of the artifacts. The minimum age of the archaeological material cannot be established, however, by geological means. The precise age of the Renier site, as an element in the local topography, can be closely approximated by reference to the geological history of the area. This is because the location of the site (Fig. 1) relates it to pro- and post-Valders lake stages in the basins of Green Bay and Lake Michigan.

The Renier artifacts were found in wind-blown sand on top of beach deposits consisting of stratified sand, silt, and gravel. The maximum elevation of this sand ridge is about 616 feet above sea level. Depth from the surface to the top of the underlying beach deposits varied from about 2 to 8 feet (elevation 614 to 608 feet). A small gravel pit 145 feet to the northeast exhibited stratified beach deposits extending from about the present surface (608 to 609 feet) to below the bottom of the pit (present elevation 600 feet). The sand mantle is apparently wind-blown and reworked from the original beach deposits of sand, silt, and gravel. That this erosion has lowered the height of the unaltered beach to an average elevation of about 610 to 612 feet at the site is readily apparent. The present altitude of the ridge, including its sandy cover reworked from original beach materials, probably may be taken to closely represent the height of the original shore feature, that is, about 616 feet maximum above sea level.

Thwaites and Bertrand (1957: 869), summarizing present knowledge of post-glacial lake levels as recorded by beach relics in this area, state: "It is clear that in the Door Peninsula all lake features higher than the 600- to 605-foot Nipissing beach are all referable to Lake Algonquin and its immediate successors." In this connection, however, we are obliged to call attention to an error in their mapping of the Algonquin beach in the Red Banks area, a very small error in a work of their scope, but one of critical importance to this study. On their map of the "Pleistocene Geology of the Door Peninsula, Wisconsin" (Thwaites and Bertrand 1957, Pl. 8), they trace the Algonquin beach along the shore of Green Bay to Red Banks where they erroneously indicate it as being south of the Nicolet Road — an area considerably lower than the ridge that is immediately north of the road and that is actually the Algonquin beach in this area. Likewise, they have displaced the Nipissing beach a trifle to the south of its true location. Both the Algonquin and the Nipissing stages are well recorded north

of the Nicolet Road by prominent ancient shore features. Our survey of this area agrees in all particulars with the detailed mapping of this area by Goldthwait (1907: 93):

> South of Whitney's bluff no beaches were seen until Point Comfort (just north of Kishkekwanteno) was reached. There a large series of sand ridges was found, at levels as follows: low sand bars at 8 feet, a few rods back from the lake near summer cottages; a 17-foot sand ridge on the private road about 100 rods inland; 19 and 22 feet, other sand ridges near the last mentioned; and at 35–38 feet, a dune ridge of sand (*this is the ridge on which our site is located*), with an uneven crest and a steeper back slope than most true beach ridges. This dune ridge runs for 200 yards or so through the woods and then breaks up into a group of sand hills. Between this place and Kishkekwanteno, among a cluster of cottages, imperfect marks of old lake levels, including one definite bench and bluff of a 12 foot stage, were noted.

Goldthwait's description is a close one of the Renier site area although the geographical designations have changed somewhat since 1907. Point Comfort, as we have indicated before, is another name for part of the Red Banks area and is still used to refer to a small section of beach cottages on the bay at the end of the Point Comfort Road. "Kishkekwanteno" is elsewhere identified by Goldthwait as the now defunct steamer landing which used to be at the present site of the Red Banks Supper Club at the local memorial to Jean Nicolet. All of the various beach features described by Goldthwait are still clearly observable.

Our identification of the sandy ridge in the upper levels of which the artifacts were found as the highest Algonquin beach is critical in light of the typology of the archaeological material. This identification is based on excellent field evidence (elevational data and the sequence of beach remnants closer to the present shore) that accords with the major interpretations of post-glacial lake succession in this region (Goldthwait 1907; Thwaites 1943; Thwaites and Bertrand 1957). A review of the complicated post-glacial lake stages in the general region of the Upper Great Lakes is beyond the scope of this paper. Anyone interested in securing such a background picture is referred to Mason (1958) for an archaeologist's view of late glacial and postglacial history of this area or Hough (1958) for a more detailed account.

Throughout most of the Door Peninsula the preserved shore features of Lake Nipissing are approximately level and are recorded at the modern altitude of 600±5 feet. This reflects that post-Nipissing uplift has not been of sufficient magnitude or differentiation to greatly warp the recorded water-planes. The elevations of Lake Algonquin shore features present a different situation.

Because of marked isostatic readjustment of the land in a roughly south to north direction for some time after retreat of the Valders ice, the shore lines of Lake Algonquin (the first post-glacial lake to occupy the Green Bay–Lake Michigan basins) are characteristically warped or tilted from south to north. The farther north these earlier beaches are traced, the higher is their elevation above present lake level. Thus, at Bay Settlement near the base of the Door Peninsula, the highest recorded Algonquin beach stands today at about 28 feet above modern lake level (609 feet), while on Rock Island, about 70 miles north-northeast, the highest Algonquin beach is nearly 100 feet above modern lake level. Subsequent lake levels are recorded clearly in the northern sector and they exhibit less inclination. Generally in this region the younger the water-plane, the less is its angle of inclination. The northernmost limit of horizontal Algonquin beaches in this region (the hinge line or zero isobase north of which the beaches have been progressively uplifted) is roughly on a line drawn from De Pere in the Fox Valley to between Kewaunee and Two Rivers on Lake Michigan (Hough 1958, Fig. 42).

Goldthwait (1907, Pl. 37) records the highest beach (Algonquin) at almost 30 feet above modern lake level (611.5 feet) at Point Comfort and records the maximum possible height here as being at 35 to 38 feet above lake level (616.5 to 619.5 feet). The Nipissing stage is shown at an approximate altitude of 598 feet above sea level. Beach features between the highest and the Nipissing beaches probably register falling stages of Lake Algonquin. Thwaites and Bertrand's (1957, Fig. 16) reconstruction of the profiles of warped beaches of the Door Peninsula is taken from Goldthwait's figure.

Hough places Lake Algonquin between about 9800 and 8000 years ago on the basis of radiocarbon dates. These dates are interpreted to span the Early to Main Algonquin lake stages as well as the intervening Kirkfield low water stage. His dates for the Nipissing stage are 4000 to 3000 B.P. (Hough 1958, Table 22).

The identification of the site as being on the Main Algonquin beach and the available radiocarbon age determinations dating that beach

enable us to place a maximum possible age on the archaeological material found there. Because the ridge was not available for habitation until after the Main Algonquin lake stage had fallen from its maximum extent, it is certain that the artifacts cannot date before about 8500 years ago, assuming the correctness of the Algonquin dates. That the site was not occupied immediately after the formation of the beach is indicated by the incorporation of the artifacts in sand apparently derived by wind action on the exposed beach. Absence of indications of water rolling of the artifacts is compatible with this interpretation. How much later the human habitation occurred cannot be determined by geological means. For this, we are forced to rely on typological indicators.

DISCUSSION

The principal stations in the western United States bearing on the Eden-Scottsbluff problem are either too well known to justify extended treatment here beyond a few remarks as to age indications (Finley site, Wyoming; Blackwater Draw No. 1, New Mexico; MacHaffie site, Montana) or are still unpublished and their information as yet unavailable (Horner site, Wyoming). The most adequate summary is still that of Wormington (1957). Suffice it to observe that wherever Eden and Scottsbluff points have been recovered in situ, there usually has been geological or paleontological evidence of appreciable antiquity. At the only partly reported San Jon site, New Mexico, however, geological studies attempting to synchronize the local with the broader Southwest alluvial chronology and to relate this to the Midwest glacial chronology have suggested a post-Altithermal age for an unreported number of Scottsbluff points apparently associated with *Bison bison* remains (Judson 1953). This dating rests on the assumption that the critical Sand Canyon formation, in which were found "Collateral Yuma" points and partly fossilized bones of *Bison bison*, is post-Altithermal (post-Judson's "Megathermal") in origin. There is an alternative interpretation of the geological evidence that would make the Sand Canyon formation pre-Altithermal (pre-Judson's "Megathermal") and allow greater age for the associated cultural material (Judson 1953: 63, 65–6). The alternative interpretation is supported by archaeology. The definitely pre-Altithermal San Jon type point was found in a level correlative with that in which a Folsom point was found. Associated bones of an extinct bison species, probably *Bison taylori*, likewise support the latter interpretation and is further reinforced by the typological similarity of the San Jon and Scottsbluff type points (Roberts 1942, Fig. 2).

Current age estimates for Eden and Scottsbluff points range from about 9000 to 6000 years ago (7000–4000 B.C.). A possibly earlier age for some Scottsbluff or proto-Scottsbluff points is suggested by the artifacts associated with the first mammoth at Santa Isabel Iztapan in the Valley of Mexico (Aveleyra Arroyo de Anda and Maldonado-Koerdell 1953; incidentally, compare their Fig. 105 *l*, with Schultz and Frankforter 1948, Fig. 8, 7598). Except for this find, Scottsbluff and Eden projectile points seem definitely to be post-Folsom. The early radiocarbon dates averaging 9524±450 B.P. (C–471) at the Lime Creek site, Nebraska, do not date Scottsbluff points (Libby 1955: 107). While a Scottsbluff point (two are reported, but the identification of one of them is questionable) was found in Zone I of this important site (Schultz and Frankforter 1948; Davis 1953), the radiocarbon dates were made on charred wood found in clay *beneath* Zone I and can thus be employed to indicate only the maximum possible age of the point in question.

Somewhat more internally consistent age estimates for Scottsbluff and Eden points seem to derive from the still unpublished Horner site, Wyoming, and from the Blackwater Draw No. 1 locality, New Mexico (the "Clovis" site). The evidence from Blackwater Draw No. 1 suggests at least partial contemporaneity of the Portales complex and Eden-Scottsbluff and indirectly tends to confirm the Horner site radiocarbon dates for Eden and Scottsbluff type projectile points. At the Horner site radiocarbon dates made on charred bones averaged 6876±250 B.P. while dates from a possible hearth averaged 6920±500 B.P. (C–302, C–795; Libby 1955: 125).

Both Eden and Scottsbluff points have been cited for Stratum 5 (the Portales horizon) at the Blackwater Draw No. 1 locality, New Mexico, but the differences between the specimens so identified and the other Stratum 5 projectile points are slight (Sellards 1952: 72–4, Fig. 37). Wormington (1957: 112) has already noted the

close similarity of some of the Portales horizon points with the Milnesand type. We have personally examined eight good Scottsbluff and Eden points, however, from this site (Stratum 5?) in the collections of the University Museum, University of Pennsylvania. While radiocarbon dates for Stratum 5 Eden-Scottsbluff points are lacking, the Portales horizon at the Sanders Gravel Pit on the Baxter ranch near Portales has yielded radiocarbon age determinations of 6300±150 and 6230±150 B.P. (Wormington 1957: 112; Krieger 1957: 323). It is most unfortunate that radiocarbon dates are not available for the Finley site in Wyoming. Moss (1951: 81) suggests an age of 7000 to 9000 years for the "Yuma" points on the basis of detailed geochronological studies tentatively tied to the midwestern glacial and post-glacial sequence.

Moving somewhat eastward we may note that projectile points of Eden and Scottsbluff types are of substantial antiquity in at least some areas near the Upper Great Lakes. This is indicated by Elson's finding such points in areas of southern Manitoba, but not on the bed of extensive glacial Lake Agassiz II (Elson personal communication). This vast lake, a pro-Valders feature, is thought to have drained prior to 3600 years ago (Elson 1957: 1001).

What information we have leads us to conclude that Scottsbluff and, particularly, Eden points occur only rarely in and east of the Mississippi Valley. Many finds described as "Scottsbluff" and "Yuma" have been reported, but often similarities to western types have been exaggerated. Nevertheless, enough points of very probable Scottsbluff affinity have been found to indicate the presence of small bands of hunters related to the Eden-Scottsbluff complex in some areas of the eastern United States. Warren L. Wittry of the Wisconsin Historical Society has reported to us several Scottsbluff points from Wisconsin. Like the Renier material, they were manufactured of quartzite.

Two projectile point fragments, resembling Scottsbluff bases, were found by Greenman at the George Lake site, Ontario, but in association with a heavy quartzite industry that we find hard to interpret in a context other than Archaic (Greenman and Stanley 1942; Greenman 1943). Related material excavated by Lee (1954 and 1955) at the Sheguiandah site, Manitoulin Island, Ontario, includes some early type projectile points, but nothing strictly identifiable as Scottsbluff or Eden artifacts.

Some broad correlations of early types of lanceolate projectile points and post-glacial lake stages in the Upper Great Lakes area have recently been attempted by Quimby (1959). The Renier site seems to provide further confirmation of his chronological interpretations. It is interesting to note that many of the point types with which he deals are also manufactured of quartzite in this Upper Great Lakes area (Quimby 1959: 425).

Logan (1952, Pl. 6 G) illustrates a Scottsbluff point from Level 5–6 (specific level not indicated) of Graham Cave, Montgomery County, Missouri. Graham Cave Fluted, lanceolate, and Dalton or Meserve points were found in the same level as the Scottsbluff point and, in diminishing frequencies, in the higher levels of the cave. Level 5–6 also produced side-notched points, though in lesser frequency than obtained in the upper levels. The lower levels of Graham Cave (Levels 6 to 4) are thought to show a cultural complex in process of change from paleo-Indian to Early Archaic. Level 6 (the bottom level) has produced radiocarbon dates of 9700±500 B.P. (M–130) and 8830±500 B.P. (M–131). Level 4 has been dated at 7900±500 B.P. (M–132), or 1800 years later than the oldest date for Level 6 (Crane 1956: 666–7). Presumably, these dates bracket the age of the Scottsbluff point found in Level 5–6. In his discussion of Graham Cave affinities Logan alludes to the discovery of similar points recovered as surface finds associated with fluted points near Hannibal, Missouri (Logan 1952: 69; Eichenberger 1944).

That some Scottsbluff points have also been found in parts of Ohio is attested by Arthur George Smith of the Firelands Museum (personal communications) and by John Witthoft of the Pennsylvania State Museum (in conversation). Witthoft has seen what he describes as a fine example of the Eden type from Ohio. This point was within the size range of the western material.

Early types of projectile points have been excavated in small numbers in northern Alabama in the Pickwick Basin. These rare finds lend support to the contention that some of the Tennessee River shell mounds and other sites represent long periods of intermittent occupation probably beginning, in at least four cases, somewhat before the initial deposition of mid-

den. Three sites in northern Alabama: the Colbert Creek Mound, Site Lu°54 (Webb and DeJarnette 1942: 92–3, Pl. 132, Fig. 2); the Wright Mound No. 1, Site Lu°63 (1942: 146–58); and the Wright Village, Site Lu°65 (1942: 173–8, Pl. 207, Fig. 1), each yielded a recognizable fragment of a fluted point (Webb and DeJarnette 1942: 304, Table 41). Specific provenience information on these important artifacts is not presented, but they are listed as "traits" of the Copena focus. Data accumulated in the Early Man field since are sufficient to judge the validity of this assignment and do not require comment. Fluted points occur in great numbers, of course, as surface finds in northern Alabama and surrounding areas.

More important for our study are the finds by Webb and DeJarnette (1942: 58–80) at the Perry station, Site Lu°25, Unit 1, Alabama. Twenty-four "Yuma" points bearing finely executed transverse oblique flaking were excavated, with but one exception, in the bottom levels of the shell mound. Two of these projectile points are illustrated in their Plate 101, Figure 2 (the two right-hand specimens). The resemblance to Scottsbluff points is self-evident. Unfortunately, the photograph does not incorporate a scale, and there are no published dimensions. Our attempt in the summer of 1958 to locate these points in the archaeological storerooms at Moundville, Alabama, met with no success.

Depth distribution records and projection against the generalized profile for Site Lu°25, Unit 1, indicate appreciable antiquity for these projectile points. Webb and DeJarnette conclude (1942: 75) that ". . . this type seems to represent a technique used in the early stage of the midden which never extended to zone A or to the pottery levels." It may further be suggested that these "Yuma" points predate the beginning of shell midden accumulation and were deposited on the water-laid sand at its base some time between these two events. The Perry shell mound, like most of the middens in this region, shows extensive disturbance where later groups of Indians dug into and through the deposits of earlier inhabitants to bury their dead and excavate refuse and storage pits. Storage pits extended as much as one and a half feet below the bottom of the midden itself (Webb and DeJarnette 1942: 80, Fig. 17). Because of this stratigraphic situation with its intrusive pits and burial features, and because these "Yuma" points are unknown from other shell middens, it seems likely that the 24 Scottsbluff points from Site Lu°25 antedate the earliest period of midden accumulation.

In view of the size of the Wisconsin and the Louisiana Scottsbluff points, the lack of metrical information for the Perry site specimens is extremely unfortunate. Clarence H. Webb (1948) describes surface finds of Scottsbluff points made in northern Louisiana and in Arkansas. The five Scottsbluff points illustrated by Webb from Louisiana are all longer than any of the projectile points recovered at the Finley station (average 8.5 cm. in length). Except for one specimen which is longer than any of the Renier site points, the Louisiana points fall in the Renier site range (average 11.0 cm. in length). In addition to these finds of Scottsbluff points we know of at least one probable Eden point from northeastern Alabama (Kleine 1953).

Suhm and Krieger (1954: 478) give the length range of Scottsbluff points as 5 to 15 cm. The specimens they illustrate, presumably from Texas, not only bridge the size gap between the Renier site Scottsbluff points and those from some of the western stations, but also include examples of the slightly expanded bases characteristic of the Renier site Scottsbluff points (Suhm and Krieger 1954, Pl. 118 *E–H, K, N*). This same feature is expressed, while not as pronouncedly, in one of the two Scottsbluff projectile points from the Scottsbluff bison quarry in Nebraska (Barbour and Schultz 1932, Fig. 169 *e*) and in one of the points from the Finley site, Wyoming (Satterthwaite 1957, Fig. 4, *A–17*). The Renier site Eden points, as reconstructed (Table 1, 2 *a, b*), remain absolutely larger than any of their western counterparts. The largest Eden point illustrated by Suhm and Krieger (1954, Pl. 92) is approximately 3.8 cm. shorter than the reconstructed Renier site Eden points. The Texas specimen is probably from the Llano Estacado area (Suhm and Krieger 1954: 418).

While not enough data are available for definite statements, because of lack of sites and reports on those sites which have been excavated, it does appear that Scottsbluff points on the periphery of central distribution (Texas, Louisiana, Wisconsin) are as a group noticeably larger than the specimens from the better known sites in the High Plains. This size dif-

ference may be correlated with a tendency toward more deeply inset stems.

From all the above data from excavated Eden-Scottsbluff sites, it seems that the range of distribution of these two types is wider than formerly thought, but much narrower than that of certain of their predecessors, namely Clovis. The center of distribution of Eden and Scottsbluff points appears to be in the High Plains, including the prairie provinces of Canada. We have produced evidence to show, however, that the known limits of this distribution extend much farther: northeastward into Wisconsin and southeastward into northern Alabama. Occasional finds of Eden and Scottsbluff points as far afield as Alaska (Wormington 1957: 124) and as far east as Ohio may eventually extend this range when data are available from excavated sites in these regions. Such distributional information will undoubtedly have bearing on the origin or origins of these point types.

In this connection, Griffin (1956: 23) has experimentally proposed the thesis that the origins of Eden and Scottsbluff points are to be found in the Mississippi Valley ". . . where stemmed forms are much more common and varied, and begin in the post-Fluted Blade Archaic over a wide area." This stimulating proposal we reject in favor of its antithesis. We feel that the series of early post-Folsom paleo-Indian points yields sufficient evidence of an evolutionary sequence to certain stemmed forms like Scottsbluff to militate against the proposal of an "outside" — and implied Archaic — origin for stemmed points arising in a paleo-Indian milieu by diffusion. After all, a little more lateral grinding on a straight-based lanceolate projectile point could readily have inaugurated this new departure. The Eden forms may be a case in point.

Within the Eden-Scottsbluff complex, Eden points as such are much less common although they appear to have a similar range. To our knowledge the only sites where Eden points have actually been excavated are in Wyoming (Horner and Finley sites), Colorado (Claypool site), New Mexico (the Blackwater Draw No. 1 locality), and Wisconsin (Renier site). At all of these sites Scottsbluff points were also found. Excavated sites yielding Scottsbluff but not Eden points include the Scottsbluff Bison Quarry and the Lime Creek sites, Nebraska; MacHaffie, Montana; Graham Cave, Missouri; George Lake, Ontario; Obscher, Texas; San Jon, New Mexico; and possibly Santa Isabel Iztapan No. 1, Mexico. Eden points never occur alone in excavated sites and are always accompanied by Scottsbluff points, which do occur by themselves at many sites. The reasons for this unequal distribution may be in part chronological.

Summary

The scattered fire-altered indications of one-time human activity at the Renier site record the cremation of an individual whose corpse was accompanied into the crematory fire by grave goods or personal belongings. The accompanying artifacts are of several categories, and the most important of these are projectile points with Eden and Scottsbluff types the most diagnostic. The entire feature probably dates before about 6000 years ago because of age data and inferences on correlative western material. That it probably does not exceed the estimated age of 8500 years is contingent on the current age estimates for the Main Algonquin lake stage represented by the fossil beach which here constitutes the natural matrix of the cultural materials.

Associated with the Eden-Scottsbluff artifacts was a side-notched point whose affinities may be with the 8430-year old Simonsen (Turin) points linked with *Bison occidentalis* in western Iowa. The contemporaneity of such totally different projectile point traditions indicated by the ages of Eden-Scottsbluff points in the High Plains and the age of the Simonsen-Turin complex in Iowa is clearly supported by the finds at the Renier site in northeastern Wisconsin. A culture-contact situation seems the most reasonable explanation, one involving paleo-Indian and Archaic traditions. The Renier site extends the known range of the late paleo-Indian into an area heretofore regarded as beyond the limits of the Eden-Scottsbluff distribution.

Another important contribution of the Renier site to the prehistory of the Upper Great Lakes area is the support it lends to attempts at relating particular types of artifacts to the relative chronology (fast becoming an absolute chronology because of radiocarbon dating) afforded by the numerous pro-and post-glacial lake stages recorded by fossil beaches throughout much of

this area (Greenman 1943; Greenman and Stanley 1942; Lee 1954, 1955; MacNeish 1952; Mason 1958; Quimby 1958, 1959). If the developing correlation of archaeological and geological features is a valid one, such Eden-Scottsbluff manifestations as the Renier site should be located on topographic features of pre-Nipissing, pre-Altithermal origin. In short, the Renier site is located right about where it should be.

It seems likely that the Renier site complex represents the second earliest known traces of man in Wisconsin and neighboring regions, a complex involving paleo-Indian and Archaic elements second in age only to the fluted points that occur in this area south of the Valders drift margin.

NOTE ON TERMINOLOGY

We are not in agreement with present fashion to classify point complexes like Eden-Scottsbluff in a "Plains Archaic" category. Such usage reflects too much preoccupation with chronological problems and not enough concern for culture content.

The subsistence pattern and limited artifact inventory of so-called Plains Archaic groups is not that of eastern Archaic assemblages with which the terminology implies some kind of relationship. On the contrary, it is essentially similar to that of Folsom and Clovis; and the size and structure of the social system must have been closely related. The tendency to relatively large semi-permanent habitation areas with its implications of increasing population density in the eastern Archaic is foreign to what is known of the makers of Eden, Scottsbluff, Plainview, and similar points. We feel that terms like "Archaic" or "paleo-Indian" should properly refer to "culture types" defined by formal traits and their combinations and without regard to chronology. Obviously, we are not denying that age is an attribute of cultural assemblages or that our classificatory scheme has chronological implications. But classifications erected on culture-content data (and terms like paleo-Indian and Archaic are loaded in this direction) are directly analogous to systematics of species or genus classification in paleontology. We know of no paleontologist who would classify two collections of shells in the same taxonomic unit merely because they occurred in beds of the same or similar age.

Because Eden, Scottsbluff, Plainview, Angostura, and such point assemblages exhibit a markedly similar stone-working tradition with the fluted-point complexes and likewise shared a similar mode of life, we suggest that they should all be classified paleo-Indian, an admittedly bad term because of the "paleo" prefix. Numerous discoveries have related this highly specialized stone-working tradition with the specific life-way of big-game hunting. It not only includes finely-controlled percussion and pressure techniques, frequently exhibited by parallel "ribbon" flaking or fluting, but is always expressed in basically lanceolate point shapes. Simple stems may or may not be present, but notching is unknown. It also includes fine pressure retouch and edge-dressing, near universality of basal and lateral edge grinding, and other techniques shown in certain recurring scraper, graver, and knife forms. Notably lacking in this technology are stone tools shaped by grinding, pecking, and polishing. It seems the most reasonable course to infer that all these groups sharing a fundamentally similar economy and technology also shared a similar social system, one appropriate to the predominance of the male role in food getting. The culture-type classification is one based on these kinds of data which stress subsistence pattern and technology. Thus, while Folsom, Scottsbluff, and similar points, are classifiable as paleo-Indian, such a complex as that at the Simonsen site, while old, cannot be so classified because of the technological criteria (Agogino and Frankforter 1960). The Simonsen finds seem to reflect an Archaic technology superimposed on a paleo-Indian economy.

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LATE PLEISTOCENE EXTINCTION AND RADIOCARBON DATING*

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ABSTRACT

All radiocarbon dates from North America, associated with extinct Late Pleistocene mammals, those from levels stratigraphically later than levels with extinct forms, and dates associated with recent fauna are tabulated alphabetically by site. Dates associated with extinct fauna are cross-referenced in an alphabetical listing of species. Dates considered invalid are tabulated and are not utilized in formulating conclusions. Most herding animals, such as the Columbian mammoth, horse, camel, and bison, as well as the dire wolf, rapidly became extinct about 8000 years ago. The dates suggest a southward withdrawal from the Great Plains by the mammoth and a partial contemporaneity of Clovis elephant hunters in southern Arizona with Folsom bison hunters on the Plains. Dates for the extinction of the Imperial mammoth are probably too early. The mastodon may have survived in isolated areas after the extinction of other forms. The super bison may have become extinct earlier than 8000 years ago and *Bison bison* seems to have been present in some areas before the extinction of *B. antiquus*. Radiocarbon dates do not support the supposed late survival of the ground sloth. Extinction apparently occurred earlier in the Great Basin and Coahuila than in intervening areas.

SINCE the discovery of artifacts associated with extinct bison at Folsom, New Mexico, in 1927, abundant archaeological, geological, and paleontological evidence for widespread extinction of the late Pleistocene megafauna in North America during the postglacial period has been accumulated. This megafauna, which consisted of large terrestrial mammals, usually herbivorous and gregarious, characterized the Pleistocene epoch of North America. Radiocarbon dates associated with extinct mammals in North America, from the Valley of Mexico to Alaska, are surveyed in this paper in an attempt to clarify problems concerning late Pleistocene mammalian extinction (compare Jelinek 1957, Martin 1958). Extinction (non replacement of forms in a specific ecological niche) may have occurred in two ways (Eiseley 1943: 212): Type 1, swift and total decline of all forms, especially those species that live in herds; Type 2, lingering survival in isolated areas, probably confined to solitary living species. Does the evidence from radiocarbon dates indicate one of these two types of extinction to be more frequent? Is it possible at this time, utilizing radiocarbon dates of extinct mammal bones or carbonaceous material associated with these bones, to arrive at a date (with a margin of error of 1000 years) for the extinction of the late Pleistocene megafauna in North America, different dates for the extinction of this fauna in various portions of North America, or different dates for the extinction of different species?

There are a number of problems involved in uncritical application of radiocarbon dates in the resolution of temporal problems.

1. The association is poor, that is, the radiocarbon sample is not contemporaneous with the fossil.
2. The sample dated has been contaminated at some time since deposition making the date either younger or older than the true date.
3. The one sigma indicates that one in every three determinations is liable to fall outside the limits published due to the error involved in counting random events (Zeuner 1955).
4. Some materials do not yield as reliable dates as others (Broecker and Kulp 1956: 7).
5. Samples inadequate in quantity have been dated and published.
6. There is a possibility of laboratory error.

In spite of these problems the radiocarbon method is generally accepted and where the accompanying evidence from archaeology, paleontology, and other fields is in agreement with published radiocarbon dates, these dates are commonly used in the interpretation of past events. Moreover, a number of limitations hamper any attempt to date late Pleistocene faunal extinction by radiocarbon. Too few dates have been published, and many of the published dates are clustered in a few geographic areas. Many excellent late Pleistocene faunal assemblages have not yet been dated, and many assemblages are dated by only one radiocarbon assay. Also there has been no over-all evaluation of the validity of the dated sites.

Although these limitations greatly circumscribe the analysis of late Pleistocene extinction at this time, it is possible to survey the dates relative to extinction and arrive at some conclusions which may be taken as hypotheses to

(*continued on page 63*)

* Presented at the 24th Annual Meeting of the Society for American Archaeology, Salt Lake City, April 30, 1959.

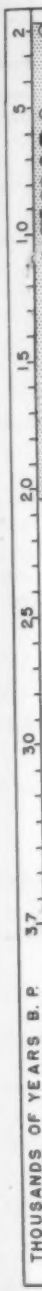

FIG. 1. Radiocarbon-dated chronology of survival of late Pleistocene mammals. Black circles, accepted dates; white circles, questioned dates.

TABLE 1. RADIOCARBON DATES ASSOCIATED WITH EXTINCT FAUNA.
Arranged alphabetically by site name

Site	Sample	Date	Comment
Allen site, Nebraska; Frontier complex (Holder and Wike 1949; Libby 1955)			
	*C–108a	8,274 ± 500	Charcoal
	*C–470†	10,493 ± 1500	Charcoal, lower occupation zone
American Falls Reservoir, Idaho; no culture (Rubin and Alexander 1958)			
	W–358	32,000+	Charcoal beneath bison skull
Astor Pass, Nevada; no culture (Jones 1925; Broecker and Kulp 1957)			
	L–364cr	16,800 ± 600	Marl
	L–364cs	17,500 ± 600	Shell from L–364cr
Burnet Cave, New Mexico; Clovis (Schultz and Howard 1935; Libby 1955)			
	*C–823†	7,432 ± 300	Charcoal below Clovis point
Clovis, New Mexico; Portales complex (Stock and Bode 1936; Brannon and others 1957)			
	O–169	6,300 ± 150	Uncharred bison bone
	O–170	6,230 ± 150	Charred bison bone
Coville Farm, Michigan; no culture (Flint and Deevey 1959: 173)			
	M–639	13,200 ± 600	Bone from woodland muskox
Cromwell, Indiana; Archaic (Burmaster 1932; Crane and Griffin 1958a)			
	M–138†	5,300 ± 400	Wood associated with mammoth
Crypt Cave, Nevada; culture (Orr 1952; Broecker and Kulp 1957)			
	L–289g	9,700 ± 200	Tufa 110–65 feet above cave, is probably
	L–356g	10,000 ± 220	pre-occupation; *Equus* in lowest occupa-
	L–356h	9,700 ± 200	tion level is thus later than these dates
	L–364da	10,700 ± 240	
Evansville, Indiana; no culture (Rubin and Alexander 1958)			
	W–418	9,400 ± 250	Wood from Megalodon beds
Fairbanks, Alaska; no culture (Broecker, Kulp, and Tucek 1956; Kulp and others 1952)			
	*C–301	12,622 ± 750	Wood from level associated with extinct fauna
	*M–38	16,400 ± 2000	Bison horn sheaths
	*L–127	28,000+	Skin and tissue of bison
	*L–157b	25,000+	Wood from same level as L–127
Fishbone Cave, Nevada; culture (Orr 1956b; Broecker, Kulp, and Tucek 1956)			
	L–245†	11,400 ± 250	Juniper roots, lowest occupation level
	L–289kk†	7,830 ± 350	Netting, top of lowest occupation level
Gypsum Cave, Nevada; Gypsum (Harrington 1933; Libby 1955)			
	*C–221	10,902 ± 440	
		10,075 ± 550	
		av. 10,455 ± 340	Sloth dung, from Room 1, 6-foot level
	*C–222	av. 8,527 ± 250	Sloth dung, from Room 1, 2-foot level
Hermit's Cave, New Mexico; culture (Schultz 1943; Rubin and Alexander 1958)			
	W–495	12,900 ± 350	Charcoal from hearth
	W–498	11,850 ± 350	Log from extinct animal horizon
	W–499	12,270 ± 450	Log at mouth of cave
Jackson County, Michigan; no culture (Crane and Griffin 1958a)			
	M–507	12,200 ± 700	Wood associated with Jefferson mammoth
James Allen site, Wyoming; Yuma (Wormington 1957; Crane and Griffin 1958a)			
	M–304	7,900 ± 400	Burned bison bones
Kassler Quadrangle, Colorado; no culture (Rubin and Alexander 1958; Rubin and Suess 1956)			
	W–288†	4,885 ± 160	Twigs under mammoth bones
	W–401	10,200 ± 350	Molar of mammoth

All dates are given in years B.P.
* Solid carbon date
† Date has been questioned; see Table 4

TABLE 1. RADIOCARBON DATES ASSOCIATED WITH EXTINCT FAUNA (continued).
Arranged alphabetically by site name

Site	Sample	Date	Comment
Kings Ferry, New York; no culture (Flint and Deevey 1959: 147)			
	Y–460	11,410±410	Spruce wood associated with Mastodon skeleton
Las Vegas Wash, Nevada; culture ? (Simpson 1933; Libby 1955)			
	*C–914	23,800+	Charcoal from hearth
Lehner site, Arizona; Clovis (Lance 1959; Haury, Sayles and Wasley 1959)			
	*A–30†	8,330±450	Charcoal from Hearth 2
	*A–32†	7,022±450	Charcoal from Hearth 2
	*A–34†	7,205±450	Charcoal from Hearth 1
	*A–40a	12,000±450	Charcoal from Hearth 2
	*A–40b	10,900±450	Charcoal from Hearth 2
	K–554	11,180±140	Charcoal from Hearth 2
	M–811	11,290±500	Charcoal from Hearth 2
Lenawee County, Michigan; no culture (Wormington 1957; Crane and Griffin 1958a)			
	M–282	9,568±1000	Wood immediately below tusk
	M–280	7,070±240	Inside portion of tusk
	M–281	7,820±450	Outside portion of tusk
Lewisville, Texas; Clovis (Brannon and others 1957; Crook and Harris 1958)			
	O–235†	37,000+	Charcoal from Hearth 1
	O–248†	37,000+	Charcoal from Hearth 8
Lime Creek, Nebraska; Scottsbluff (Davis and Schultz 1952; Libby 1955)			
	*C–471†	9,880±670	
		9,167±600	
		av. 9,524±450	Charcoal under lowest occupation zone
Lubbock, Texas; Folsom (Evans 1950; Libby 1955; Broecker and Kulp 1957)			
	L–283g	9,700±450	Snail shells from Folsom level slightly above C–558
	*C–558	9,883±350	Burned bison bones
Mexico, D.F.; no culture (Rubin and Alexander 1958)			
	W–488	8,540±350	Carbonate fraction of Becerra formation soil
	W–493	7,940±300	Organic carbon from Becerra formation soil
Midland, Texas; White Sand, probably Clovis; Gray Sand, Folsom (Wendorf and others 1955; Wendorf and Krieger 1959)			
	L–347†	20,400±900	Carbon from caliche rocks, Gray Sand
	L–304c†	13,400±1200	Snail shells from White Sand
	M–388†	8,670±600	Bones from White Sand
	M–411†	7,100±1000	Concentrated carbon from bones, Gray Sand
Muncie, Indiana; no culture (Rubin and Alexander 1958)			
	W–325	9,755±300	Wood from Buck Creek Ditch fossil bed
Naco, Arizona; Clovis (Lance 1953; Wise and Shutler 1958; Lance 1959)			
	*A–9, 10	9,250±300	Charcoal surrounding mammoth bones
Northern Lights, Ohio; no culture (Flint and Deevey 1959: 149)			
	Y–526	11,480±160	Wood associated with skull of *Castoroides* sp.
Orleton Farms, Ohio; no culture (Thomas 1952; Crane 1956)			
	M–66	*9,600±500	
		*8,460±600	
		8,420±400	Wood associated with mastodon

All dates are given in years B.P.
*Solid carbon date
† Date has been questioned; see Table 4

TABLE 1. RADIOCARBON DATES ASSOCIATED WITH EXTINCT FAUNA (continued).
Arranged alphabetically by site name

Site	Sample	Date	Comment
Pictograph Claim, South Dakota; no culture (Rubin and Suess, 1956)			
	W–223	9,700±600	Muskox bones impregnated with carnotite
Plainview, Texas; Plainview (Sellards, Evans and Meade 1947; Broecker and Kulp 1957; Brannon and others 1957)			
	L–303	9,800±500	Snail shells from bone bed
	O–171†	7,100±160	Organic portion of bison bones
Port Talbot, Ontario; no culture (Flint and Deevey 1959: 9)			
	L–440	>29,500	Wood associated with mastodon tusk
Rampart Cave,‡ Arizona; no culture (Wilson 1942)			
	L–473d	35,500	Sloth dung, 54-inch level
	L–473c	12,050±400	Sloth dung, 18-inch level
	L–473a	10,050±350	Sloth dung, surface
Rancho La Brea, California; no culture (Stock 1956; Flint and Deevey 1959: 151–2)			
	Y–354b	13,890±280	
	Y–354a	14,110±420	Log in tar pit
	Y–355a	14,500±210	
	Y–355b	15,390±230	
Red Smoke, Nebraska; Plainview (Davis 1953; Libby 1955)			
	*C–824	8,570±300	
		9,153±600	
		av. 8,862±230	Charcoal from hearth in Terrace 2A fill
Russell Farm, Michigan; no culture (Flint and Deevey 1959: 173)			
	M–347	5,950±300	Tusk fragments
St. Petersburg, Florida; culture (Broecker, Kulp, and Tucek 1956; Simpson 1929)			
	L–211†	2,040±90	Charcoal from unconsolidated strata with extinct fauna
Sandia Cave, New Mexico; Sandia (Hibben 1941; Crane 1956)			
	M–247†	20,000+	Tusk
	M–349†	20,000+	Tusk
Santa Isabel Iztapan, Mexico; Scottsbluff and Lerma points (Aveleyra Arroyo de Anda 1956; Libby 1955)			
	*C–204	16,000+	Wood from Becerra formation, Armenta horizon
	*C–205	11,003±500	Peat from Becerra formation, Armenta horizon
Santa Rosa Island, California; culture ? (Orr 1956a; Crane and Griffin 1958b; Broecker, Kulp, and Tucek 1956; Broecker and Kulp 1957)			
	L–290z	33,000+	Calcareous sand from dune in alluvium at 40-foot level
	L–290r	29,700±3000	Charred mammoth bones, 36-foot level
	M–599	16,700±1500	Charcoal from middle of mammoth beds
	L–244	15,820±280	Wood from mammoth-bearing level
	L–290t	12,500±250	Charcoal from 9-foot level
Sheridan, New York; no culture (Flint and Deevey 1959: 174)			
	M–490	9,200±500	Mastodon rib
Washtenaw County, Michigan; no culture (Wormington 1957; Crane 1956)			
	M–67	*6,300±500	
		6,100±400	Tusk fragments
Whitewater Draw, Arizona; Sulphur Spring stage Cochise (Sayles and Antevs 1941; Wise and Shutler 1958; Libby 1955)			
	*A–67	8,200±260	Charred wood
	*C–216	7,756±370	Charcoal
	*C–511†	6,210±450	Charcoal

All dates are given in years B.P.
* Solid carbon date
† Date has been questioned; see Table 4
‡ Date made available by Geochronology Laboratories, University of Arizona, and National Park Service

TABLE 2. RADIOCARBON DATES STRATIGRAPHICALLY LATER THAN EXTINCT MAMMALS
Arranged alphabetically by site name

Site	Sample	Date	Comment
Allen Site, Nebraska; Frontier complex (Holder and Wike 1949; Libby 1955)			
	*C–65	5,256 ± 350	Charcoal, above *Bison antiquus*
Lehner Site, Arizona; later than Clovis (Wise and Shutler 1958; Haury, Sayles, and Wasley 1959)			
	*A–33†	7,133 ± 350	Swamp soil above hearths; above *Mammuthus columbi, Equus* sp., *Bison* sp., *Tapirus* sp.
	*A–31†	6,877 ± 450	
		6,356 ± 450	Swamp soil above hearths; above *Mammuthus columbi, Equus* sp., *Bison* sp., *Tapirus* sp.
Lindenmeier, Colorado; later than Folsom (Roberts 1936; Libby 1955)			
	*C–451	5,020 ± 300	Charcoal; above *Bison antiquus*
Lubbock, Texas; Folsom (Libby 1955; Broecker and Kulp 1957)			
	L–283g	9,700 ± 450	Snail shells; above *Mammuthus* sp.
	*C–558	9,883 ± 350	Burned bone; above *Mammuthus* sp.
Murray Springs, Arizona; Sulphur Spring stage Cochise (Wise and Shutler 1958)			
	*A–69	8,250 ± 200	Charcoal; overlies *Mammuthus* sp.
Paisley Cave (Five Mile Point Cave 3), Oregon; culture (Cressman 1942; Preston, Person, and Deevey 1955)			
	Y–109	7,610 ± 120	Charcoal; above *Camelops* sp., *Equus* sp.
Seward Peninsula, Alaska; no culture (Broecker, Kulp, and Tucek 1956)			
	L–137g	10,200 ± 800	Wood from muck; overlies *Mammuthus* sp., *Equus* sp., *Bison* sp.
	L–137n	9,400 ± 750	Wood from muck; overlies *Mammuthus* sp., *Equus* sp., *Bison* sp.

All dates are given in years B.P.
* Solid carbon date
† Date has been questioned; see Table 4

be tested in the future. The following assumptions underlie the conclusions in this paper:

1. The radiocarbon method of age determination is valid.

2. All dates are assumed to fall within one sigma of the published date.

3. Unless specifically questioned all dates and associations are accepted at face value.

4. All paleontological identifications are accepted as correct.

It may not be possible to date precisely the extinction of any species, but it should be possible to chart the history of survival (Fig. 1). In this fashion we may set an upper limit on the time of extinction. A lower limit may be established by the appearance of modern fauna. The publication of a large number of radiocarbon dates makes it possible to bracket with some certainty the interval during which extinction occurred. All dates published through December, 1959, have been reviewed and those pertinent to the problem of extinction are tabulated here (Tables 1–5). The laboratory sample prefixes and the published sources of the various dates are listed by Johnson in Flint and Deevey (1959; see also McNutt and Wheeler 1959).

Use of the information compiled here varies with the nature of the extinction problem isolated by the researcher. The major works to date on Late Pleistocene extinction problems are those of Jelinek (1957) and Martin (1958). The main interest of these studies may be characterized as follows: Jelinek — association of man and extinct fauna; Martin — the nature of extinction and its causes. The present study is an attempt to establish the chronology of this extinction.

Jelinek has reviewed the association of five genera (mammoth, horse, camel, sloth, and bison) with each other and man in five geographic provinces in western North America. These associations are divided into a sequence of cultural-faunal horizons with artifactual and faunal index fossils for each. The basic reasoning involved is an analysis of presence and

(*continued on page* 66)

TABLE 3. RADIOCARBON DATES ASSOCIATED WITH RECENT FAUNA.
Arranged alphabetically by site name

Site	Sample	Date	Comment
Angostura, South Dakota; Angostura (Hughes 1949; Libby 1955; Crane 1956)			
	*C–604	7,073±300	Charcoal from hearth
		7,715±740	
	M–370	9,380±500	Charcoal from soil
Danger Cave, Utah; Desert culture (Jennings 1957)			
	M–202	10,270±650	Charcoal, lowest occupation level
	M–204	10,270±650	Charred sheep dung, lowest occupation level
	*C–611	9,789±630	Charcoal, lowest occupation level
	*C–640	8,960±340	Charred rat dung, lowest occupation level
	M–118	11,000±700	Mountain sheep dung, pre-occupation level
	C–609	11,453±600	Wood, charcoal, dung, pre-occupation level
Diablo Cave, Tamaulipas; Lerma phase (Crane and Griffin 1958a)			
	M–499	9,270±500	Carbon
Fort Rock Cave, Oregon; culture (Cressman 1942; Libby 1955)			
	*C–428	9,188±480	
		8,916±540	
		av. 9,053±350	Sandals
Frightful Cave, Coahuila; Cienegas complex (Taylor 1956; Crane and Griffin 1958a, 1958b)			
	M–184	7,300±400	Sandals, lowest level
	M–187	8,080±450	Sandals, lowest level
	M–188	8,023±350	Human feces, lowest level
	M–191	8,870±350	Cut wood, lowest level
Horner, Wyoming; Yuma (Jepsen 1953; Libby 1955)			
	*C–302	6,619±350	
		7,132±350	
		av. 6,876±250	Burned bison bone
	*C–795	6,151±500	
		7,690±850	
		av. 6,920±500	Charcoal from hearth
Lind Coulee, Washington; culture (Daugherty 1956; Libby 1955)			
	*C–827	9,400±940	
		8,518±460	
		av. 8,700±400	Charcoal from hearth
Ojo de Agua Cave, Tamaulipas; Infiernillo culture (Crane and Griffin 1958a)			
	M–500	8,540±450	Carbon
Portales Cave, Tamaulipas; Infiernillo culture (Crane and Griffin 1958a)			
	M–498	8,200±450	Vegetable materials
Russell Cave, Alabama; Archaic (Crane and Griffin 1958a; Broecker and Kulp 1957)			
	M–589	8,240±400	Charcoal, 8-foot level
	M–590	8,560±400	Charcoal, 12–13-foot level
	L–344	7,950±200	Charcoal, 13-foot level
	M–766	9,020±350	Charcoal, 23-foot level

All dates are given in years B.P.
* Solid carbon date

TABLE 4. RADIOCARBON DATES IN TABLES 1–3 WHICH HAVE BEEN QUESTIONED.
Arranged alphabetically by site name

Site	*Sample*	*Date*	*Comment*
Allen Site, Nebraska			
	*C–470	10,493 ± 1500	Sample is from below occupation level (Roberts 1951: 21)
Burnet Cave, New Mexico			
	*C–823	7,432 ± 300	Clovis is considered older than this (Wormington 1957: 53)
Cromwell, Indiana			
	M–138	5,300 ± 400	Williams (1957: 368) states that J. B. Griffin has indicated that a second run of this sample produced a date nearly twice this age.
Fishbone Cave, Nevada			
	L–245	10,900 ± 300 11,555 ± 500 av. 11,200 ± 250	Wormington (1957: 192) quotes Heizer as doubting association of man and extinct fauna due to mixture of deposits. He also questions validity of dates.
	L–289kk	7,830 ± 350	
Kassler Quadrangle, Colorado			
	W–288	4,885 ± 160	Geological deposit is early Wisconsin in date; twigs may be intrusive (Rubin and Suess 1956: 445)
Lehner Site, Arizona			
	*A–33	7,133 ± 350	In an analysis of the cultural remains present, stratigraphy, geology, and corroborative radiocarbon dates from the Copenhagen and Michigan laboratories, Haury, Sayles, and Wasley (1959: 24–5) state that these dates are not acceptable
	*A–31	6,877 ± 450	
	*A–30	8,330 ± 450	
	*A–32	7,022 ± 450	
	*A–34	7,205 ± 450	
Lewisville, Texas			
	O–235	37,000 +	Acceptance of these dates would require stability of Clovis points over a period of at least 27,000 years. Also this would indicate a higher degree of flint chipping in the New World than the Old World at the same time (Krieger 1957)
	O–248	37,000 +	
Lime Creek, Nebraska			
	*C–471	9,880 ± 670 9,167 ± 600 av. 9,524 ± 450	Schultz believes this date too recent. He would correlate this level with the Two Creeks bed, about 11,000 B.P. (Wormington 1957: 121)
Midland, Texas			
	L–347	20,400 ± 900	Wendorf and Krieger (1959: 77–8) state that dates L–347 and L–304c cannot be reconciled as they are in reverse of the stratigraphic order. In addition, for a number of reasons, they believe dates M–388 and M–411 are too young
	M–411	7,100 ± 1000	
	M–388	8,670 ± 600	
	L–304c	13,400 ± 1200	
Plainview, Texas			
	O–171	7,100 ± 160	Bones had been exposed to contamination by modern plant rootlets; date probably too recent (Wormington 1957: 108)
St. Petersburg, Florida			
	L–211	2,040 ± 90	This anomalously low date for extinct fauna is suspect on the basis that the strata are unconsolidated and the fauna may have been redeposited. Mammal remains (all recent fauna) from Florida shell middens have been dated at 5,000 to 3,500 years B.P. No extinct species were present (Neill, Gut, and Brodkorb 1956)

All dates are given in years B.P.
* Solid carbon date

Table 4. Radiocarbon Dates in Tables 1–3 Which Have Been Questioned (continued)
Arranged alphabetically by site name

Site	Sample	Date	Comment
Sandia Cave, New Mexico			
	M–247	20,000+	Crane (1955: 690) states these samples may be older than the culture as the count of these samples was the same as the dead carbon control samples.
	M–349	20,000+	
Whitewater Draw, Arizona			
	*C–511	6,210±450	E. B. Sayles states that due to laboratory error this sample cannot be identified as to provenience of site or cultural level.

All dates are given in years B.P.
* Solid carbon date

absence of the genera in each cultural deposit. Absence of a form is assumed to mean extinction. In this paper, with a larger amount of data to work with (more species, more sites, and more radiocarbon dates) the horizons described by Jelinek do not appear to be as clear cut. The association of mammoth with Clovis hunters, *Bison antiquus* with Folsom hunters, and *Bison occidentalis* with parallel flake point cultures does seem to be generally true. However these horizons may be described more as cultural than faunal (see Lance 1955 for a discussion of the problems of dating early man by paleontology). Extinction of specific species in specific areas as interpreted by Jelinek seems to rely too much on negative evidence to be valid (see Lance 1959: 38–9 for a more detailed critique of Jelinek's work). The fauna throughout the Late Pleistocene seems to have been a unit with some regional specializations. Extinction (as indicated in Fig. 1) of most of these species probably occurred at about the same time.

Martin has examined data on extinction with the purpose of delimiting the nature of Late Pleistocene extinction and then has tried to find the cause or causes of it. As a result of his work it is apparent that Late Pleistocene extinction was extinction without replacement in the specific ecological niche, in contrast to the replacement of forms throughout the rest of the Cenozoic. This extinction was postglacial in time and affected in the main the larger mammals. The principal factor isolated as cause is the appearance of man. Martin's tentative conclusions based on radiocarbon dates include (Martin 1958: 405):

(1) Mexican and Alaskan large mammals were the first to be eliminated, this in Late-Glacial time; (2) the Plains Megafauna disappeared in the early part of the Postglacial period; (3) eastern temperate forest and tropical rainforests were the last continental refugia for large mammals; (4) the Floridian savanna, surrounded by forest, served as a refuge for plains herbivores after they had disappeared elsewhere in western North America.

Conclusions in the present paper were formulated by an analysis of the terminal dates for each species, plus the dates stratigraphically later than extinct fauna and dates associated with recent fauna. No questioned dates were utilized. With some species the time interval so bracketed was several thousand years in length; with others the interval was less than one thousand years. The principal fallacy involved in this analysis is the undue weighting of the few terminal dates. Only with the analysis of many more radiocarbon samples will this source of error be reduced.

Conclusions

1. The majority of the Pleistocene megafauna living in herds, Columbian mammoth, horse, camel, bison, and a carnivore, dire wolf, became extinct about 8000 years ago. This represents extinction of Type 1.

2. *Mammuthus columbi* is stratigraphically earlier than *Bison antiquus* in the great plains (Sellards 1952: 54–5, 116). The dates from Naco (9250±300) and Whitewater Draw (8200 ±260, 7756±370), Arizona, are later than those from Plainview (9800±500) and Lubbock (9883 ±350), Texas. This suggests the possibility of a withdrawal of the mammoth from the Plains to the southern basin-and-range province. If this is true it is possible that Clovis hunters migrated in the same direction and were hunt-

(*continued on page 74*)

TABLE 5. ALPHABETICAL LISTING OF EXTINCT* FAUNA AND ASSOCIATED RADIOCARBON DATES

Fauna	*Site*	*Sample*	*Comment*	*Date*
Arctodus sp. (cave bear)				
	Burnet Cave, New Mexico	C–823	Q	7,432 ± 300
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Bison antiquus (extinct bison)				
	Allen Site, Nebraska	C–470	Q	10,493 ± 1500
		C–108a	TD	8,274 ± 500
	Burnet Cave, New Mexico	C–823	Q	7,432 ± 300
	Lewisville, Texas	O–235	Q	37,000+
		O–248	Q	37,000+
	Lime Creek, Nebraska	C–471	Q	9,880 ± 670
				9,167 ± 600
				av. 9,524 ± 450
	Lubbock, Texas	C–558		9,883 ± 350
		L–283g		9,700 ± 450
	Plainview, Texas	L–303		9,800 ± 500
		O–171	Q	7,100 ± 160
	Rancho La Brea, California	Y–354b		13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
	Red Smoke, Nebraska	C–824	TD	9,153 ± 600
				8,570 ± 300
				av. 8,862 ± 230
	Sandia Cave, New Mexico	M–247	Q	20,000+
		M–349	Q	20,000+
Bison bison (modern bison)*				
	Angostura, South Dakota	C–604		7,715 ± 740
				7,073 ± 300
		M–370		9,380 ± 500
	Danger Cave, Utah	C–611		9,789 ± 630
		C–640		8,960 ± 340
	Ft. Rock Cave, Oregon	C–428		9,188 ± 480
				8,916 ± 540
				av. 9,053 ± 350
	Frightful Cave, Coahuila	M–191		8,870 ± 350
		M–187		8,080 ± 450
		M–188		8,023 ± 350
		M–184		7,300 ± 400
	Horner Site, Wyoming	C–302		6,619 ± 350
				7,132 ± 350
				av. 6,876 ± 250
		C–795		6,151 ± 500
				7,690 ± 850
				av. 6,920 ± 500
	Lind Coulee, Washington	C–827		9,400 ± 940
				8,518 ± 460
				av. 8,700 ± 400
Bison crassicornis (super bison)				
	Fairbanks, Alaska	L–127		28,000+
		L–157b		25,000+
		M–38	TD	16,400 ± 2000

All dates are given in years B.P.
* All forms are extinct except *Bison bison*
Q Date has been questioned; see Table 4
TD Terminal date, that is, most recent date published for the species

TABLE 5. ALPHABETICAL LISTING OF EXTINCT* FAUNA AND ASSOCIATED RADIOCARBON DATES (continued)

Fauna	*Site*	*Sample*	*Comment*	*Date*
Bison latifrons (super bison)				
	American Falls Reservoir, Idaho	W–358	TD	32,000+
	St. Petersburg, Florida	L–211	Q	2,040±90
Bison occidentalis (extinct bison)				
	James Allen Site, Wyoming	M–304	TD	7,900±400
	Las Vegas Wash, Nevada	C–914		23,800+
Bison sp. (extinct bison)				
	Clovis, New Mexico	O–169	TD	6,300±150
		O–170	TD	6,230±150
	Fairbanks Creek, Alaska	C–301		12,622±750
	Lehner, Arizona	K–554		11,180±140
		M–811		11,290±500
		A–40a		12,000±450
		A–40b		10,900±450
		A–30	Q	8,330±450
		A–32	Q	7,022±450
		A–34	Q	7,205±450
	Midland, Texas	M–388	Q	8,670±600
		L–304c	Q	13,400±1200
	Naco, Arizona	A–9, 10		9,250±300
	Whitewater Draw, Arizona	A–67	TD	8,200±260
		C–216	TD	7,756±370
Breameryx minor (Tar pit pronghorn)				
	Rancho La Brea, California	Y–354b	TD	13,890±280
		Y–354a		14,110±420
		Y–355a		14,500±210
		Y–355b		15,390±230
Camelops sp. (camel)				
	Astor Pass, Nevada	L–364cr		16,800±600
		L–364cs		17,500±600
	Burnet Cave, New Mexico	C–823	Q	7,432±300
	Fishbone Cave, Nevada	L–245	Q	10,900±300
				11,555±500
				av. 11,200±250
		L–289kk	Q	7,830±350
	Gypsum Cave, Nevada	C–221		10,902±440
				10,075±550
				av. 10,455±340
		C–222	TD	8,527±250
	Las Vegas Wash, Nevada	C–914		23,800+
	Lewisville, Texas	O–235	Q	37,000+
		O–248	Q	37,000+
	Midland, Texas	L–374	Q	20,400±900
		L–304c	Q	13,400±1200
		M–388	Q	8,670±600
	Rancho La Brea, California	Y–354b		13,890±280
		Y–354a		14,110±420
		Y–355a		14,500±210
		Y–355b		15,390±230
	Sandia Cave, New Mexico	M–247	Q	20,000+
		M–349	Q	20,000+
	Whitewater Draw, Arizona	A–67	TD	8,200±260
		C–216	TD	7,756±370

All dates are given in years B.P.
* All forms are extinct except *Bison bison*
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TABLE 5. ALPHABETICAL LISTING OF EXTINCT* FAUNA AND ASSOCIATED RADIOCARBON DATES (continued)

Fauna	*Site*	*Sample*	*Comment*	*Date*
Canis andersoni (Anderson's coyote)				
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Canis dirus (dire wolf)				
	Gypsum Cave, Nevada	C–221		10,902 ± 440
				10,075 ± 550
				av. 10,455 ± 340
		C–222	TD	8,527 ± 250
	Hermit's Cave, New Mexico	W–495		12,900 ± 350
		W–498		11,850 ± 350
		W–499		12,270 ± 450
	Midland, Texas	L–347	Q	20,400 ± 900
		L–304c	Q	13,400 ± 1200
		M–388	Q	8,670 ± 600
	Rancho La Brea, California	Y–354b		13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
	St. Petersburg, Florida	L–211	Q	2,040 ± 90
	Whitewater Draw, Arizona	A–67	TD	8,200 ± 260
		C–216	TD	7,756 ± 370
Canis furlongi (extinct wolf)				
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Canis milleri (Miller's wolf)				
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Canis orcutti (extinct coyote)				
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Canis petrolei (Petrol coyote)				
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Capromeryx sp. (four-horned antelope)				
	Midland, Texas	L–347	Q	20,400 ± 900
		L–304c	Q	13,400 ± 1200
		M–388	Q	8,670 ± 600
		M–411	Q	7,100 ± 1000
Castoroides sp. (giant beaver)				
	Northern Lights, Ohio	Y–526	TD	11,480 ± 160
Dasypodidae gen. (giant armadillo)				
	Mexico, D.F.	W–488	TD	8,540 ± 350
		W–493	TD	7,940 ± 300

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TABLE 5. ALPHABETICAL LISTING OF EXTINCT* FAUNA AND ASSOCIATED RADIOCARBON DATES (continued)

Fauna	*Site*	*Sample*	*Comment*	*Date*
Equus sp. (horse)				
	Astor Pass, Nevada	L–364cr		16,800 ± 600
		L–364cs		17,500 ± 600
	Burnet Cave, New Mexico	C–823	Q	7,432 ± 300
	Crypt Cave, Nevada	L–289g		9,700 ± 200
		L–356g		10,000 ± 220
		L–356h		9,700 ± 200
		L–364da		10,700 ± 240
	Evansville, Indiana	W–418		9,400 ± 250
	Fairbanks, Alaska	C–301		12,622 ± 750
	Fishbone Cave, Nevada	L–245	Q	10,900 ± 300
				11,555 ± 500
				av. 11,200 ± 250
		L–289kk	Q	7,830 ± 350
	Gypsum Cave, Nevada	C–221		10,902 ± 440
				10,075 ± 550
				av. 10,455 ± 340
		C–222	TD	8,527 ± 250
	Las Vegas Wash, Nevada	C–914		23,800+
	Lehner, Arizona	K–554		11,180 ± 140
		M–811		11,290 ± 500
		A–40a		12,000 ± 450
		A–40b		10,900 ± 450
		A–30	Q	8,330 ± 450
		A–32	Q	7,022 ± 450
		A–34	Q	7,205 ± 450
	Lewisville, Texas	O–235	Q	37,000+
		O–248	Q	37,000+
	Midland, Texas	L–347	Q	20,400 ± 900
		M–388	Q	8,670 ± 600
		L–304c	Q	13,400 ± 1200
	Plainview, Texas	L–303		9,800 ± 500
		O–171	Q	7,100 ± 160
	Rampart Cave, Arizona	L–473d		35,500
		L–473c		12,050 ± 400
		L–473a		10,050 ± 350
	Rancho La Brea, California	Y–354b		13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
	St. Petersburg, Florida	L–211	Q	2,040 ± 90
	Sandia Cave, New Mexico	M–247	Q	20,000+
		M–349	Q	20,000+
	Whitewater Draw, Arizona	A–67	TD	8,200 ± 260
		C–216	TD	7,756 ± 370
Euceratherium collinum (musk ox)				
	Burnet Cave, New Mexico	C–823	Q	7,432 ± 300
Felis bituminosa (Black cat)				
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230

All dates are given in years B.P.
* All forms are extinct except *Bison bison*
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TABLE 5. ALPHABETICAL LISTING OF EXTINCT* FAUNA AND ASSOCIATED RADIOCARBON DATES (continued)

Fauna	*Site*	*Sample*	*Comment*	*Date*
Felis daggetti (extinct mountain lion)				
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Glyptodon sp. (giant armadillo)				
	Lewisville, Texas	O–235	Q	37,000+
		O–248	Q	37,000+
Mammut americanum (mastodon)				
	Cromwell, Indiana	M–138	Q	5,300 ± 400
	Kings Ferry, New York	Y–460		11,410 ± 410
	Lenawee County, Michigan	M–282		9,568 ± 1000
		M–280		7,070 ± 240
		M–281		7,820 ± 450
	Muncie, Indiana	W–325		9,755 ± 300
	Orleton Farms, Ohio	M–66		9,600 ± 500
				8,460 ± 600
				8,420 ± 400
	Port Talbot, Ontario	L–440		>29,500
	Rancho La Brea, California	Y–354b		13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
	Russell Farm, Michigan	M–347	TD	5,950 ± 300
	St. Petersburg, Florida	L–211	Q	2,040 ± 90
	Sandia Cave, New Mexico	M–247	Q	20,000+
		M–349	Q	20,000+
	Sheridan, New York	M–490		9,200 ± 500
	Sussex County, New Jersey	L–231		10,890 ± 200
	Washtenaw County, Michigan	M–67	TD	6,300 ± 500
				6,100 ± 400
Mammuthus columbi (Columbian mammoth)				
	Las Vegas Wash, Nevada	C–914		23,800+
	Lehner, Arizona	K–554		11,180 ± 140
		M–811		11,290 ± 500
		A–40a		12,000 ± 450
		A–40b		10,900 ± 450
		A–30	Q	8,330 ± 450
		A–32	Q	7,022 ± 450
		A–34	Q	7,205 ± 450
	Naco, Arizona	A–9, 10		9,250 ± 300
	Plainview, Texas	L–303		9,800 ± 500
		O–171	Q	7,100 ± 160
	Rancho La Brea, California	Y–354b		13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
	St. Petersburg, Florida	L–211	Q	2,040 ± 90
	Whitewater Draw, Arizona	A–67	TD	8,200 ± 260
		C–216	TD	7,756 ± 370

All dates are given in years B.P.
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Table 5. Alphabetical Listing of Extinct* Fauna and Associated Radiocarbon Dates (continued)

Fauna	Site	Sample	Comment	Date
Mammuthus exilis (dwarf mammoth)				
	Santa Rosa Island, California	L–290z		33,000+
		L–290r		29,000±3000
		M–599		16,700±1500
		L–244		15,820±280
		L–290t	TD	12,000
Mammuthus imperator (Imperial mammoth)				
	Rancho La Brea, California	Y–354b		13,890±280
		Y–354a		14,110±420
		Y–355a		14,500±210
		Y–355b		15,390±230
	St. Petersburg, Florida	L–211	Q	2,040±90
	Santa Isabel Iztapan, Mexico	C–204		16,000+
		C–205	TD	11,003±500
Mammuthus primigenius (woolly mammoth)				
	Kassler Quadrangle, Colorado	W–288	Q	4,885±160
		W–401	TD	10,200±350
Mammuthus sp. (mammoth)				
	Fairbanks Creek, Alaska	C–301	TD	12,622±750
	Hermit's Cave, New Mexico	W–495	TD	12,900±350
		W–498	TD	11,850±350
		W–499	TD	12,270±450
	Jackson County, Michigan	M–507	TD	12,200±700
	Lewisville, Texas	O–235	Q	37,000+
		O–248	Q	37,000+
	St. Petersburg, Florida	L–211	Q	2,040±90
	Sandia Cave, New Mexico	M–247	Q	20,000+
		M–349	Q	20,000+
Megalonyx sp. (ground sloth)				
	Evansville, Indiana	W–418	TD	9,400±250
	Rancho La Brea, California	Y–354b		13,890±280
		Y–354a		14,110±420
		Y–355a		14,500±210
		Y–355b		15,390±230
	St. Petersburg, Florida	L–211	Q	2,040±90
Nothrotherium shastense (ground sloth)				
	Gypsum Cave, Nevada	C–221		10,902±440
				10,075±550
				av. 10,455±340
		C–222	TD	8,527±250
	Las Vegas Wash, Nevada	C–914		23,800+
	Rampart Cave, Arizona	L–473d		35,500
		L–473c		12,050±400
		L–473a		10,050±350
	Rancho La Brea, California	Y–354b		13,890±280
		Y–354a		14,110±420
		Y–355a		14,500±210
		Y–355b		15,390±230
Oreamnos harringtoni (mountain goat)				
	Rampart Cave, Arizona	L–473d		35,500
		L–473c		12,050±400
		L–473a	TD	10,050±350

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TABLE 5. ALPHABETICAL LISTING OF EXTINCT* FAUNA AND ASSOCIATED RADIOCARBON DATES (continued)

Fauna	*Site*	*Sample*	*Comment*	*Date*
Ovibos? sp. (muskox)				
	Pictograph Claim, South Dakota	W–223	TD	9,700 ± 600
Panthera atrox (giant jaguar)				
	Astor Pass, Nevada	L–364cr		16,800 ± 600
		L–364cs		17,500 ± 600
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Paramylodon sp. (ground sloth)				
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Platygonus sp. (peccary)				
	Lewisville, Texas	O–235	Q	37,000+
		O–248	Q	37,000+
	Midland, Texas	L–347	Q	20,400 ± 900
		L–304c	Q	13,400 ± 1200
		M–388	Q	8,670 ± 600
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
	St. Petersburg, Florida	L–211	Q	2,040 ± 90
Preptoceras sinclairi (muskox)				
	Burnet Cave, New Mexico	C–823	Q	7,432 ± 300
Rangifer? fricki (caribou)				
	Burnet Cave, New Mexico	C–823	Q	7,432 ± 300
Sangamona sp. (cervid)				
	Burnet Cave, New Mexico	C–823	Q	7,432 ± 300
Smilodon californicus (saber tooth cat)				
	Rancho La Brea, California	Y–354b	TD	13,890 ± 280
		Y–354a		14,110 ± 420
		Y–355a		14,500 ± 210
		Y–355b		15,390 ± 230
Stockoceros onusrosagris (four-horned antelope)				
	Burnet Cave, New Mexico	C–823	Q	7,432 ± 300
Symbos cavifrons (woodland musk ox)				
	Coville Farm, Michigan	M–639	TD	13,200 ± 600
Tanupolama sp. (camel)				
	Gypsum Cave, Nevada	C–221		10,902 ± 440
				10,075 ± 550
				av. 10,455 ± 340
		C–222	TD	8,527 ± 250
	St. Petersburg, Florida	L–211	Q	2,040 ± 90

All dates are given in years B.P.
* All forms are extinct except *Bison bison*
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TD Terminal date, that is, most recent date published for the species.

TABLE 5. ALPHABETICAL LISTING OF EXTINCT* FAUNA AND ASSOCIATED RADIOCARBON DATES (continued)

Fauna	*Site*	*Sample*	*Comment*	*Date*
Tapirus sp. (tapir)				
	Evansville, Indiana	W–418	TD	9,400±250
	Lehner, Arizona	K–554		11,180±140
		M–811		11,290±500
		A–40a		12,000±450
		A–40b		10,900±450
		A–30	Q	8,330±450
		A–32	Q	7,022±450
		A–34	Q	7,205±450
	Rancho La Brea, California	Y–354b		13,890±280
		Y–354a		14,110±420
		Y–355a		14,500±210
		Y–355b		15,390±230
Ursus optimus (Schultz's grizzly bear)				
	Rancho La Brea, California	Y–354b	TD	13,890±280
		Y–354a		14,110±420
		Y–355a		14,500±210
		Y–355b		15,390±230
	St. Petersburg, Florida	L–211	Q	2,040±90

All dates are given in years B.P.
* All forms are extinct except *Bison bison*
Q Date has been questioned; see Table 4.
TD Terminal date, that is, most recent date published for the species.

ing mammoth in Arizona at the same time that Folsom hunters were hunting bison on the Plains.

3. The date of 11,000 B.P. for the extinction of *Mammuthus imperator* according to published dates may be too early. Type 1 extinction of other herd dwelling animals seems to cluster at 8000 B.P. Additional dates may extend the known survival of the Imperial mammoth to a more recent date.

4. The low terminal dates for the mastodon indicate survival of this species after extinction of other Late Pleistocene forms. Type 2 extinction (lingering survival in isolated areas) best explains this evidence.

5. The super bison, *Bison latifrons* and *B. crassicornis*, may possibly have become extinct at an earlier date than the mass extinction about 8000 years ago. This earlier extinction may be due to a different cause.

6. The species *B. bison* was present at least in Utah, Oregon, Washington, South Dakota, and in Coahuila, Mexico, before the extinction of *B. antiquus*.

7. The supposed late survival of the ground sloth (*Nothrotherium shastense*) is not supported by radiocarbon dates. This problem might be further clarified by dating the skin of the Aden Crater, New Mexico, sloth which is supposedly very recent in date.

8. The dates from the Great Basin, especially Danger Cave, seem to indicate that the Pleistocene megafauna may have become extinct at an earlier date in that region than in the rest of North America.

9. The Frightful Cave, Coahuila, dates (8870±350, 8080±450, 8023±350), all associated with recent fauna, may indicate that extinction occurred slightly earlier in that area than in nearby southern Arizona and New Mexico.

10. The Rancho La Brea dates (about 14,000 B.P.) indicate a more recent survival of the saber tooth cat, *Smilodon*, than was previously suspected. However, radiocarbon dates from other sites associated with a typically Rancho La Brean fauna tend to substantiate the dates for Rancho La Brea.

11. Other extinct forms are not as reliably dated; however, the suspect dates generally fall in the early postglacial period and are thus in accord with the conclusion that extinction was underway 8000 years ago.

Comparison of these interpretations with those of Jelinek and Martin will reveal similarities and dissimilarities. The general areal differences in time of extinction perceived by Mar-

tin are substantiated. Three of the cultural-faunal associations defined by Jelinek are apparent. The chronology of Late Pleistocene mammalian extinction has been outlined in a general fashion. Extinction of specific species within specific geographical provinces and the causes of this extinction are the problems that are still largely unsolved.

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THE TRUMAN MOUND SITE, BIG BEND RESERVOIR AREA, SOUTH DAKOTA*

ROBERT W. NEUMAN

ABSTRACT

Six dome-shaped, late Woodland burial mounds were excavated at this site (39BF224). Primary and secondary interments were found; either or both types may be present in a single mound. Primary burials were flexed and always found in deep pits. Each pit contained a single individual and burial offerings. Secondary interments of one or more individuals on the mound floor are represented by scattered masses of bone and also by a compact bundle burial.

Pottery from the mounds was of a single, undecorated type, described here as Truman Plain Rim. Vessels are conoidal, tan to dark brown, and tempered with quartz particles. The most distinctive characteristic of this pottery is the simple-stamped impressions extending horizontally around the vessel exteriors. Stone artifacts consist of triangular projectile points with corner notches and a straight base or side notches and a concave base, planoconvex scrapers, knife fragments, grinding stones, and retouched flakes. Bone artifacts include tubular and barrel-shaped beads and a splinter awl. Artifacts of freshwater and marine shell recovered are a pendant, spoons, rings, disc beads, and a tubular bead. Additional artifacts, found in a stratum below the mounds, represent an earlier, non-ceramic occupation.

In the concluding sections, a history of mound excavations in the central and northern Great Plains is given, and the relationships between the Truman Mounds and material from other Woodland sites in Kansas, Nebraska, South Dakota, and North Dakota are discussed.

THE TRUMAN MOUND site (39BF224) is located on the Crow Creek Indian Reservation in central South Dakota, about 2 miles west of the present community of Fort Thompson in Buffalo County. The legal description of the site is S½, SE¼, sec. 16, T107N, R72W, at 44° 03′ 45″N and 99° 28′ 15″W. It is but one of numerous prehistoric Indian sites along the Missouri River that will be destroyed by the construction of the Big Bend Dam and Reservoir.

The site consists of six low, dome-shaped, earthen burial mounds. They are situated along the southern edge of the first high terrace overlooking the Missouri River bottoms at an elevation of about 1410 feet (Fig. 1). Below the mounds and within a soil stratum *not associated* with the burial complex were a number of implements that indicate a lithic component. These few specimens show a marked similarity to material from the lithic horizons at the Medicine Crow site (39BF2) which is located about 2 miles to the northwest (Irving 1959; Coogan and Irving 1959). Due to the small number of specimens found at the Truman site, my remarks concerning this early occupation are largely of a descriptive nature. The primary concern of this report is the most recent occupation, the burial mound component.

Every mound at the site was surveyed and mapped. Next a north-south trench, divided into 5-foot squares, was excavated through the center of each mound. Individual squares were given letter and number designations according to their location on a grid oriented with magnetic north. The excavations were expanded to the east or west whenever necessary. All digging extended down to or slightly into the gravel stratum that underlies the mounds. In each mound, features were numbered consecutively, so that each mound and its associated features could be treated as a separate excavation. All measurements relating to depth were made from the top of the mound surface downward.

The stratigraphic sequence in the trench profiles was the same throughout the site. The mounds were mantled with a tough layer of sod. The mound fill lay directly below the sod. It was composed of grayish-brown silt, containing a sparse scattering of small pebbles. Below the mound fill was a zone of highly calcareous, light-colored soil with a considerable amount of small gravel. This stratum was underlain with a zone of tightly packed gravel.

MOUND 1

Mound 1 was a low dome measuring about 50 feet in diameter and 1.2 feet in maximum height.

Feature 1. A concentration of pot sherds in square N75E50 at a depth of 1.8 feet below the mound surface.

Feature 2. A secondary burial of a single adult individual. Human bones were scattered in squares N85E45 and N90E45 from 1.5 to 2.0 feet below the mound surface. Associated with the skeletal remains were three small, shell disc beads and one projectile point which was recovered from within the rib cage. Next to and slightly east of the human bone, at 1.4 feet below the surface, we located a circular outline of a pit. It meas-

* Submitted with the permission of the Secretary of the Smithsonian Institution.

ured 3.4 feet north-south and 2.7 feet east-west. The pit had a maximum depth of 1.7 feet. Two small, human skull fragments were recovered from the pit fill.

Pottery. The ceramic collection from the mounds at 39BF224 is alike in its surface treatment and form. The pottery is distinctive enough in its cultural and geographic situation to merit description as a new pottery type, Truman Plain Rim. One rim and ten body sherds from a single vessel of this type were recovered from Mound 1. This portion of the vessel was restored in the laboratory (Fig. 2 *a*).

TRUMAN PLAIN RIM

The sample consists of one restored vessel, one partially restored vessel, a complete base section, a large portion of a vessel wall and rim, nine individual rim sherds, and 219 body sherds.

Paste

Temper: A moderate amount of tiny, angular, quartz particles that closely resemble those to be seen on anthills in the Middle Missouri area. The particles range in size from 3.0 mm. to 5.0 mm. The temper often protrudes through the surface of the vessel interior.

Texture: Fine to medium coarse.

Hardness: 3.0 (calcite).

Color: Interiors are tan to dark brown. The bulging portion of the vessel walls is generally fire-clouded or darkened from use. The exterior surface is tan to dark brown.

Form

Lip: Flat to slightly rounded.

Rim: Excurved.

Shoulder: Poorly defined.

Base: Conoidal.

Surface Finish

The interior and exterior surface treatments are the most outstanding characteristics of this pottery type.

Interior: Smoothed. A few rims have parallel, vertical, simple-stamped impressions extending down from the lip for a distance of about 55 mm.

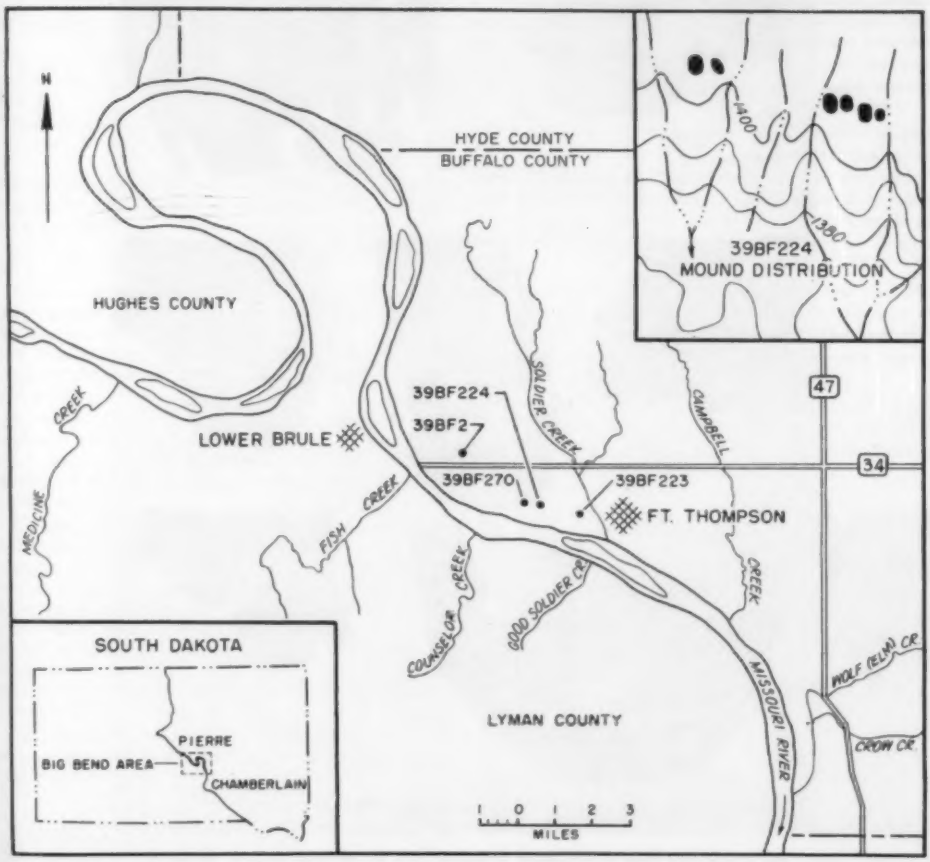

FIG. 1. Map of the Big Bend area, South Dakota, showing site locations.

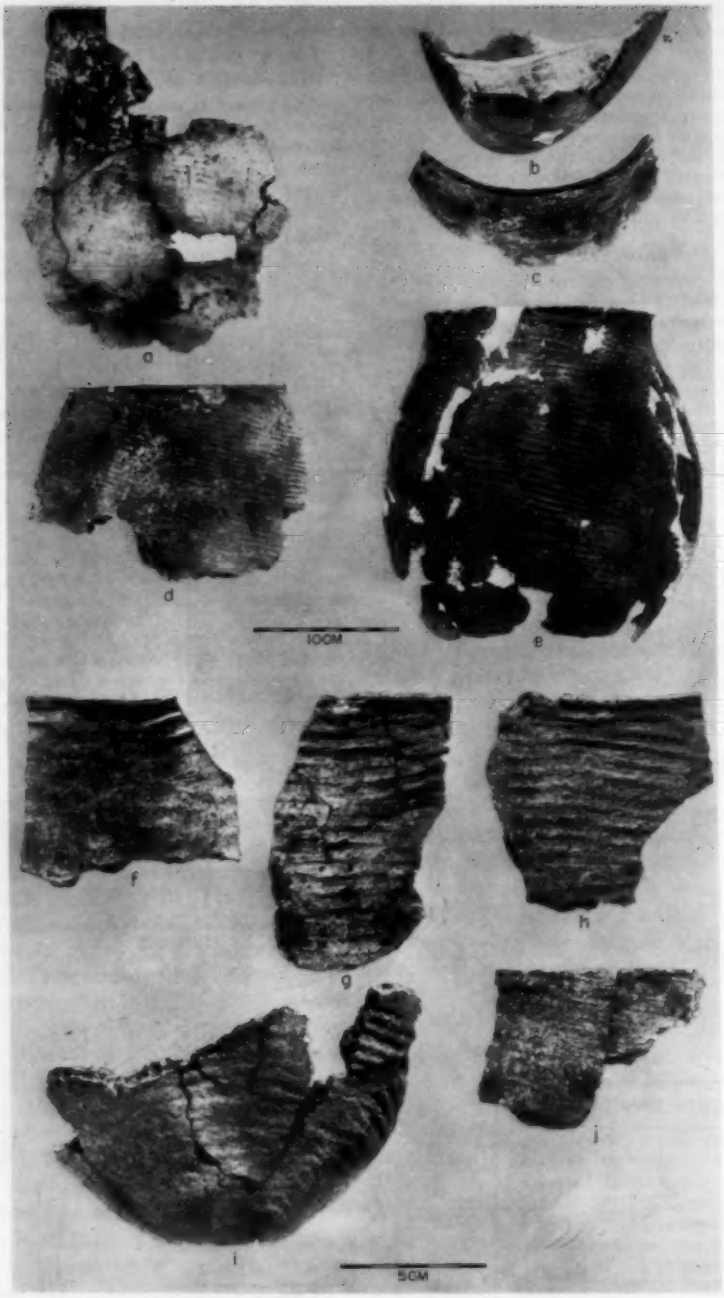

Fig. 2. Truman Plain Rim pottery. *a*, Mound 1; *b*, *f–i*, Mound 2; *c–e*, *j*, Mound 3.

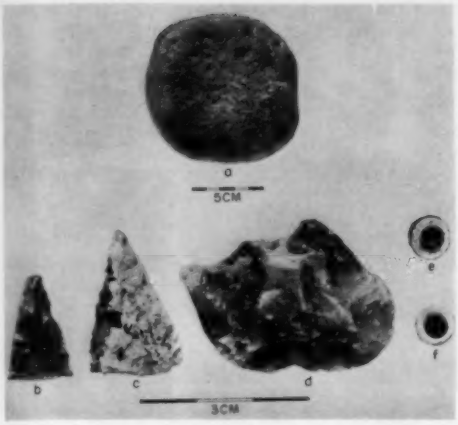

FIG. 3. Artifacts from Mound 1. *a*, grinding stone; *b*, *c*, projectile point fragments; *d*, worked flake; *e*, *f*, shell beads.

Exterior: Simple stamped. The impressions are very carefully executed and extend horizontally around the vessel.

Decoration: Absent.

Dimensions

Rims range from 5.0 mm. to 7.2 mm. in thickness. They are of the same thickness or slightly thinner than the vessel walls. The single reconstructed vessel measures 31.5 cm. in height and has a maximum diameter of 24.6 cm. The diameter of the orifice is 16.7 cm.

Projectile Points. Two partially complete specimens. One fragment is the tip section of a straight-sided quartzite point, located at square N85E50 in the 0.5- to 1.0-foot level (Fig. 3 b). The other specimen, a fragment from a triangular chert point with straight sides and base missing (Fig. 3 c), was recovered from Feature 2.

Retouched Flakes. Two specimens; irregularly shaped fragments which bear randomly placed flake scars. The quartz specimen (Fig. 3 *d*) was recovered from the mound fill; the other, a chert fragment, from the light-colored soil zone.

Grinding Stones. Five specimens; ovoid-shaped stones that appear to be moderately smoothed on one or more surfaces. One specimen has pecking scars at one end; another (Fig. 3 *a*) is pitted on one face. There is some doubt as to whether these cobbles have been altered intentionally. Four of the specimens were recovered from the 2.0- to 2.5-foot level within the light-colored stratum; the fifth was associated with Feature 2. They range from 8.1 to 12.7 cm. in length, 5.1 to 11.4 cm. in width, and 2.6 to 2.8 cm. in thickness.

Shell Beads. Three specimens; small disc-shaped beads in association with the skeletal remains in Feature 2 (Fig. 3 *e*, *f*).

MOUND 2

Mound 2 was a low dome, measuring 54 feet north-south and 46 feet east-west. It had a maximum height of 2.1 feet.

Feature 1. The remains of a secondary human burial consisting of a single adult individual and one infant with associated pottery. Skeletal fragments were scattered in the central portion of the mound in squares N80E35 and N80E40, between 0.5 and 2.1 feet below the mound surface. Rodent disturbance had obliterated any trace of a burial pit.

Pottery. Sections of at least two Truman Plain Rim vessels are represented (Fig. 2 *b*, *f–i*). Sherds were recovered from 0.5 to 3.0 feet below the mound surface. Most of the pottery, however, was found in direct association with the human bone at Feature 1.

Projectile Points. One specimen; the body and basal portion of a triangular chalcedony point. It has a straight base, slightly convex sides and side notches (Fig. 9 *c*). One of the notches is smooth from purposeful grinding or wear. There are large bifacial percussion flake scars and areas bearing patination. The specimen was located in the light-colored stratum at square N90E50 in the 2.0- to 2.5-foot level.

Scrapers. One specimen; an irregularly shaped plano-convex fragment of chalcedony. One of the longer edges has been retouched by the removal of fine flakes from the convex surface (Fig. 9 *j*). It is patinated on all surfaces. The scraper was recovered from the light-colored stratum in square N90E50 at 2.5 feet below the mound surface.

Retouched Flakes. Six specimens; irregularly shaped flakes that show a small amount of secondary flaking on one or more surfaces. Two of the specimens were associated with the human burial. The remaining four flakes were recovered from the mound fill. They are made of chalcedony, quartzite, and crystal-clear quartz (Fig. 4 *a–c*).

Bone Beads. One specimen; a tubular bird (?) bone bead with a highly polished exterior surface. Portions of both ends have been broken (Fig. 4 *d*). The bead was recovered from the central area of the mound, in square N75E45, in the 2.0- to 2.5-foot level.

Shell Beads. One specimen; two fragments of a bead or ring. The specimen has flat sides and rounded edges (Fig. 4 *e*, *f*). It was found near the center of the mound, at square N75E45, in the 2.0- to 2.5-foot level.

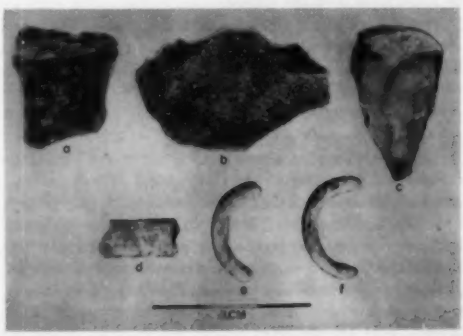

FIG. 4. Artifacts from Mound 2. *a–c*, worked flakes; *d*, bone bead; *e*, *f*, shell bead or ring fragments.

Mound 3

A low, domed tumulus, measuring 61 feet north-south and 50 feet east-west, Mound 3 was the largest mound at the site. It had a maximum height of 3.3 feet.

Feature 1. An arrangement of handsized cobbles outlining a rectangular area on the apex of the mound. The rectangle measured 2.2 feet north-south and 3.8 feet east-west. Two additional stones, 0.7 foot apart, were situated 1.3 feet from the east end of the rectangle. Two other stones were situated on the north-south axis of the rectangle. One was 1.9 feet north of the northern side of the rectangle, the other was 2.3 feet south of the southern border. All of the stones were partially buried in the sod.

Feature 2. Two secondary human burials. Burial Number 1, in square N80E50, consisted of a scattering of poorly preserved bone from a single adult male. The skeletal remains were from 1.1 to 3.2 feet below the mound surface. Pottery occurred in the lower levels of the interment. Burial Number 2 was a very compact bundle burial located in the southern edge of square N85E50. Human bone was recovered from 1.1 feet below the surface, to just below the mound floor. The bundle measured 1.6 feet north-south and 1.4 feet east-west. Parts of at least five adult individuals are represented. Bass identified four of the skulls as those of adult females. No artifacts were associated with this burial.

Feature 3. A primary human burial of an adult male between 25 and 30 years of age in square N80E50. The skeletal remains were in the bottom of a straight-sided, oval-shaped pit. The burial was in a flexed position, lying on its left side with the head toward the east. The top of the pit was located on the mound floor at a depth of 3.2 feet below the surface. It measured 2.3 feet north-south, 4.0 feet east-west, and had a maximum depth of 3.2 feet. Burial accompaniment consisted of pot sherds, two stone knife fragments, a stone scraper, one worked flint chip, a bone awl, four bone beads, one bone tube, a worked bone fragment, a shell pendant and three shell spoons.

Pottery. One reconstructed Truman Plain Rim vessel, one large rim section, three rims and 18 body sherds. Most of this pottery, except for a few sherds, was found in association with the burials.

Projectile Points. One specimen; a triangular-shaped chalcedony point with corner notches and a straight base. The base is slightly narrower than the shoulders, and a small portion of the tip is missing (Fig 5 *a*). The specimen was recovered from square N85E50 in the 0.5- to 1.0-foot level.

Scrapers. Two specimens. One scraper is ovoid in outline and planoconvex in cross section. Two sides and one end have been flaked from the convex face (Fig. 5 *b*). The specimen was found in association with the burial at Feature 3. It is made from Bijou Hills Quartzite. The second specimen is a planoconvex end scraper of chalcedony, triangular in outline (Fig. 9 *i*). The scraper was located in the light-colored stratum, square N75E50, in the 1.5- to 2.0-foot level.

Knives. Three specimens. Two are rectangular, the other is triangular in shape. They are fragments that have been bifacially flaked along one or more edges (Fig. 5 *c*). The specimens were recovered from the burial at Feature 3. Two are made from plate chalcedony, the other from milky quartz.

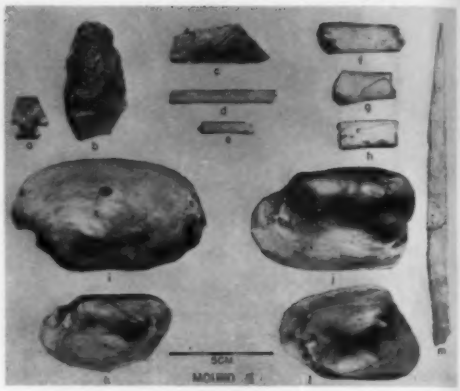

Fig. 5. Artifacts from Mound 3. *a*, projectile point; *b*, scraper; *c*, knife fragment; *d–h*, bone beads; *i*, triperforated shell pendant; *j–l*, shell spoons; *m*, bone awl.

Retouched Flakes. Two specimens; irregularly shaped flakes, generally planoconvex in cross section. One piece shows secondary chipping along a small portion of one edge. Both flakes are significant only in their provenience. The jasper piece was located with the skeletal remains in Feature 3. The other was made from crystalline quartz and was recovered from the mound fill.

Problematical Objects. Two specimens of limestone. One stone is rectangular in outline and has rounded ends. It is triangular in cross section with one straight and one slightly convex side. The apex of the triangle is smooth and has a suggestion of having been flaked from the straight side. The base and convex side have smoothed areas. The specimen measures 10.6 cm. long, 3.6 cm. wide and 1.4 cm. thick. The second object is lunate in shape. It has a smoothed area on one face near the end. The stone measures 9.2 cm. long, 3.1 cm. wide and 6 mm. thick. Both objects were recovered from the grave in Feature 3.

Bone Awls. One specimen from a splinter fragment of a rib. The pointed end and one side have been smoothed from wear. The opposite side shows little workmanship and the butt end of the awl is missing (Fig. 5 *m*). It was located in the burial pit at Feature 3.

Bone Beads. Group 1: Three specimens; large tubular-shaped beads (Fig. 5 *f–h*). Two of the specimens have irregular, rather jagged ends that have been smoothed from wear. The other bead has smooth, clean-cut ends. The exterior surface on each bead is highly polished. They were found with the burial in Feature 3. Group 2: Two specimens; small tubular-shaped beads (Fig. 5 *d, e*). One specimen is slightly flat. The end edges are rounded off and smooth. The other specimen is round. One end is smooth from wear, but rather irregular. The opposite end is fragmented. The exterior surfaces on both beads are highly polished. These specimens were also recovered from the burial in Feature 3.

Shell Pendants. One specimen; a mussel shell pendant, *Lampsilis cardium* (Rafinesque) with three perforations (Fig. 5 *i*). Two of the holes are located along the shell edge, one adjacent to the hinge, the other on the beak. The third perforation is situated on the highest point of the back. All holes appear to have been drilled from the interior face. They are fairly symmetrical and measure about 5 mm. in diameter. The exterior and interior surfaces of the pendant are polished. The specimen was lying upon the neck of the skeleton in Feature 3.

Shell Spoons. Three specimens; mussel shell valves, *Lampsilis siliquoidea* (Barnes), from the burial in Feature 3. All have been worn down at one end. The worn edges are irregular, but quite smooth (Fig. 5 *j–l*).

MOUND 4

Mound 4 was a low dome-shaped mound measuring 59 feet north-south and 49 feet east-west. It had a maximum rise of 2.7 feet.

Feature 1. A single skull of an adult male, 40 to 45 years of age, located in the mound fill at square N85E50, 1.4 feet below the surface. Although lacking the mandible, the specimen was in an excellent state of preservation (Fig. 6 *a*). It was lying face down and leaning slightly on the left side. There is a hole, 4.9 cm. in diameter, in the right temporal bone. Bass states that the hole was made after death.

Feature 2. The scattered remains of a secondary human burial. Bones of 2 adults, one child and one infant, were located in squares N80E55 and N80E50 between 2.3 and 3.2 feet below the mound surface. The adults were tentatively identified as a male and a female. There was a suggestion of a pit surrounding the bone concentration; however, rodent disturbance prevented any positive identification. Near the southeast edge of the human remains, and at a depth of 3.0 feet below the mound surface, the circular outline of a small pit was located. Further excavation revealed a straight-sided pit, 4.0 feet in diameter and 1.9 feet in depth, containing the remains of a primary burial. Here too, rodent disturbance was extensive. Artifacts recovered from the pit fill consist of one conch shell bead, two shell disc beads, and a mammal long bone.

FIG. 6. Human skull and artifacts from Mound 4. *a*, male skull from Feature 1; *b*, point; *c*, grinding stone; *d*, *e*, shell beads.

Projectile Points. One partially complete specimen. A long triangular point with very slightly convex sides and side notches (Fig. 6 *b*). A portion of the base is missing. There is some indication of an additional set of side notches directly below those present. Very carefully placed flake scars appear on each face. They extend from the longitudinal axis and run at right angles to the cutting edges. The specimen was located lying next to one of the skulls at Feature 2. It is made from Knife River Flint.

Grinding Stones. One specimen; ovoid in shape and planoconvex in cross section (Fig. 6 *c*). One side is fragmented. A large portion of the flat, bottom surface is smooth. It was recovered from square N80E50 in the 0.0- to 0.5-foot level.

Shell Beads. Group 1: Two specimens. Small disc-shaped beads (Fig. 6 *d*). One specimen is badly fragmented. Both beads were located in the pit at Feature 2. Group 2: One specimen. A rather massive tubular-shaped bead of marine shell (Gastropod). A hole has been drilled from both ends. The outer surfaces of the bead are smooth and highly polished (Fig. 6 *e*). It was recovered from the pit at Feature 2.

Metal. One specimen; a lanceolate-shaped fragment of iron from square N80E50 in the 0.0- to 0.5-foot level. In view of its provenience and a nearby refuse accumulation of recent date, I believe this specimen to be intrusive.

MOUND 5

This mound lies at the sloping edge of the terrace and has been subject to erosion. The actual contours of the mound were barely perceptible. Somewhat arbitrary measurements indicate an oval mound about 55 feet northwest-southeast and 40 feet northeast-southwest. The maximum height was about 1.0 foot. A 55-foot trench was excavated through the long axis of the rise.

Feature 1. The remains of an infant secondary human burial. It was located in square N30W50 between 0.5 to 0.9 foot below the mound surface. The bone was tightly compacted and was in a poor state of preservation. Fine particles of hematite were mixed with the fill surrounding the bone. Approximately 4.2 feet northeast of the burial, we located another concentration of human bone. Bone and shell beads and a small amount of charcoal were associated with these latter remains. There was no evidence of a pit in this mound.

Bone Beads. Nine specimens in Feature 1. Small barrel-shaped beads. The exterior surfaces of all of the specimens have been smoothed (Fig. 7 *a–g*).

Shell Beads. Group 1: 66 complete and 11 fragmented specimens from Feature 1. All are circular, but rather irregular in outline. In the majority of the specimens, the holes have been drilled from one face and are not centered. Most of the beads are patinated (Fig. 7 *h–l*). They range from 9 to 16 mm. in outside diameter, 2 to 4 mm. in inside diameter and 1 to 4 mm. in thickness.

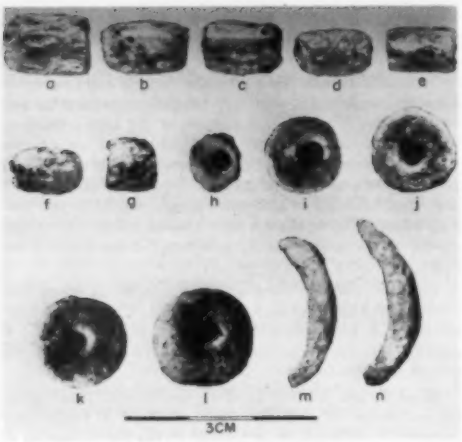

FIG. 7. Artifacts from Mound 5. *a–g*, bone beads; *h–l*, shell beads; *m*, *n*, shell bead or ring fragments.

Group 2: One specimen from Feature 1. Two crescent-shaped fragments of a bead or ring (Fig. 7 *m*, *n*). Both are heavily patinated on one face.

MOUND 6

Mound 6 is a low dome-shaped rise measuring 40 feet in diameter and 1.0 foot in height.

Feature 1. Scattered remains of poorly preserved human bone. This feature was located in square N120W55 at a depth of 1 foot below the mound surface. Associated with the bone were four disc-shaped shell beads and a bird skull. There was no evidence of a pit.

Feature 2. A crude quartzite knife located in square N105W55 at a depth of 1.7 feet below the mound surface. Associated with the knife were a few small flint chips. These artifacts were recovered from the light-colored stratum below the mound fill.

Feature 3. A concentration of three rocks and a bone fragment at square N130W55 at a depth of 2.3 feet. Two of the rocks have smoothed surfaces, the other has been fire fractured. This feature lies within the light-colored stratum below the mound fill.

Feature 4. A small concentration of bone and stone in square N130W55 at a depth of 2.7 feet below the mound surface. The only artifact recovered here was a stone side scraper. Two of the bone fragments were partially burned. This material was located in the light-colored stratum below the mound fill.

Feature 5. A few scattered flint chips, bone fragments, and a portion of a bison mandible in square N135W55 at 2.3 feet below the surface. This feature was located in the light-colored stratum below the mound fill.

Projectile Points. Four complete specimens, one mid-section, and one tip. Group 1: Two chalcedony specimens; triangular with concave bases and slightly convex sides. Although the points are regular in outline and quite thin, the flaking on each face is haphazard and crude. One point (Fig. 9 *e*) was found in square N125-W55 at 2.2 feet below the mound surface. The other specimen was in square N120W55 at a depth of 2.5 feet; a small portion of the tip is missing (Fig. 9 *f*). Both were located in the light-colored stratum. Group 2: One specimen; a triangular chalcedony point with a straight base and side notches (Fig. 9 *d*). The base is a trifle narrower than the shoulders. A small portion of the tip is missing. The point was located within the light-colored soil stratum in square N135W55 at 1.6 feet below the mound surface. Group 3: One specimen of chalcedony, a small triangular point with broad side notches and a concave base (Fig. 8 *c*). The flaking on each face is haphazard. It was recovered at square N115W50 in the 0.0- to 0.5-foot level.

Scrapers. Two specimens. Group 1: One chalcedony specimen; a triangular, planoconvex end scraper (Fig. 9 *h*). The forward working end has been formed by the removal of fine flakes. The side edges are very thin and sharp. It was recovered from square N115W55 at a depth of 2.3 feet below the mound surface. Group 2: One specimen; a concavoconvex side scraper with converging sides and blunt ends (Fig. 9 *g*). There is a suggestion of secondary flaking along a portion of one of the side edges. The specimen was recovered in Feature 4. It is made from a buff-colored piece of quartzite.

Knives. Two complete and one fragmented specimen; the two whole knives are ovoid in shape with large flake scars on both faces. The knife edges are irregular. One specimen (Fig 9 *a*) was in square N115W55 at 1.7 feet below the mound surface. It is made of chalcedony and is slightly patinated. The other complete specimen (Fig. 9 *b*) was in Feature 2. It is made from a purple quartzite. The fragmented specimen was recovered in square N130W55 at 0.8 foot below the mound surface.

Retouched Flakes. 15 specimens; small irregular-shaped pieces that have secondary flaking along one or more edges. Generally, the flakes have been removed from the more convex face. Most of the specimens were recovered from the light-colored stratum below the mound fill. They were made from flint, chalcedony, and quartzite.

Milling Stones. Two specimens; one rock is circular, the other is slightly rectangular in shape. The sides are smooth and rounded. One face on the rectangular specimen has a small concave area. These stones were located lying side by side and in association with bone, flint chips and a fire-fractured rock in Feature 3. They are made from granitic quartzite.

Bone Beads. One specimen; a small barrel-shaped bead (Fig. 8 *a*). The exterior surfaces are smooth and

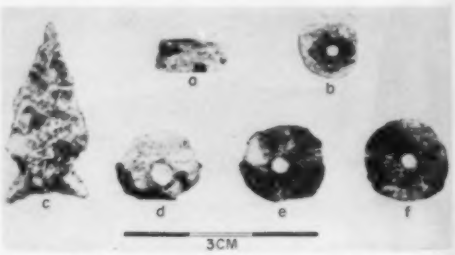

FIG. 8. Artifacts from Mound 6. *a*, bone bead; *b*, *d–f*, shell beads; *c*, projectile point.

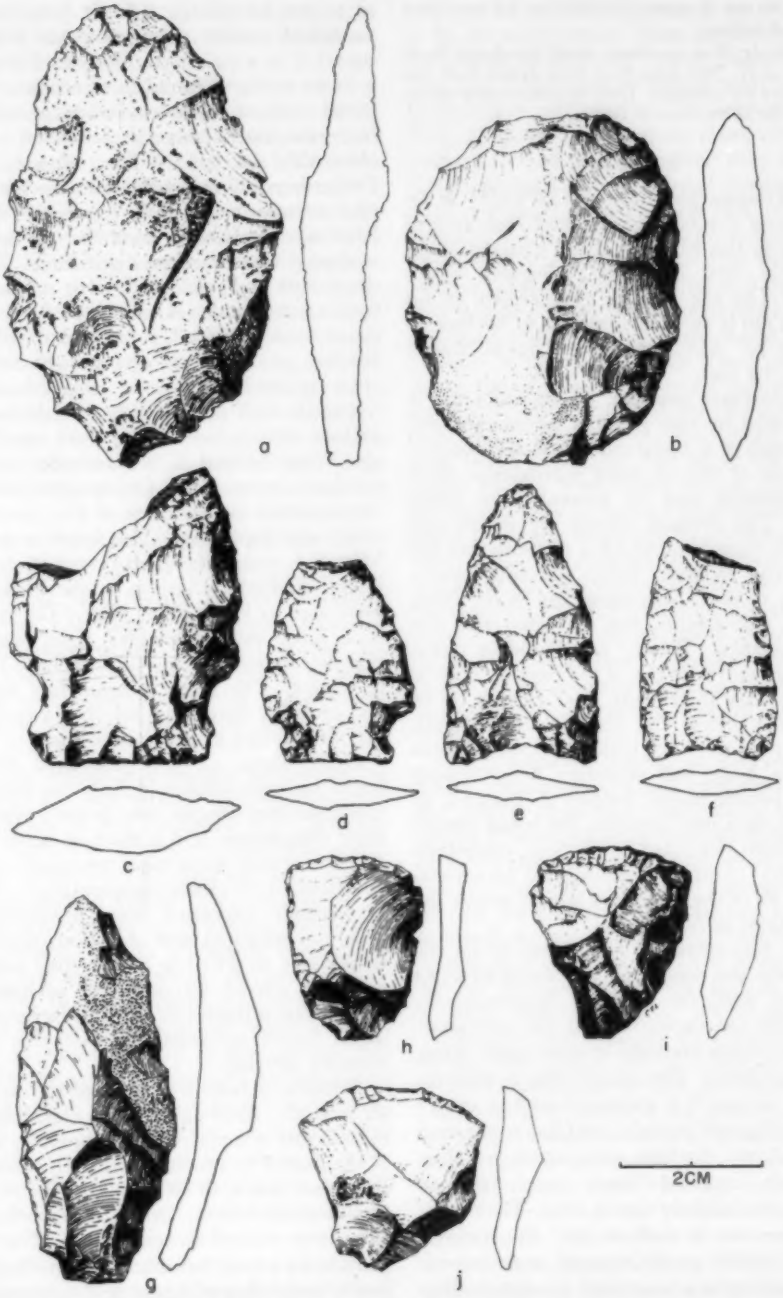

FIG. 9. Stone artifacts from the preceramic component at site 39BF224. *a*, *b*, *d–h*, from below Mound 6; *c*, *j*, from below Mound 2; *i*, from below Mound 3.

polished. It was in square N120W55 at 2.4 feet below the mound surface.

Shell Beads. Four specimens; small disc-shaped beads (Fig. 8 *b, d–f*). The holes have been drilled from one face and are not centered. These specimens were associated with the human bone in Feature 1.

Summary

The Truman Mound site (39BF224) is located along the edge of the first high terrace overlooking the Missouri River bottoms about two miles west of Fort Thompson, South Dakota. The site consists of a cluster of six burial mounds ranging from 40 to 60 feet in diameter, and having maximum apical heights of 1.0 to 3.3 feet.

The mortuary complex of the mounds is characterized by two types of interments, primary burials of a single individual and secondary burials of one or more individuals. Both burial patterns may be present in a single mound. The primary burials are flexed and located in deep, straight-sided pits dug into the base of the mound. Burial accompaniment, consisting of shell ornaments and stone, bone, and shell implements, was deposited with the human remains. Pottery was found in direct association with only one of the primary burials. The secondary interments were located on or immediately below the base of the mounds. These burials consist of loosely scattered masses of human bone; one exception being a very compact bundle burial, Feature 2, Burial 2, in Mound 3. In a few instances, the bones appear to have been deposited in shallow, irregularly shaped pits. Artifacts were located in association with all of the secondary burials except the bundle burial in Mound 3.

Pottery was recovered from three of the six mounds, the vast majority of the sherds in direct association with the burials. Approximately four vessels are represented in the collection. All of the sherds are alike in their paste, form, and surface finish. The paste is fine to medium coarse in texture; it is tempered with moderate amounts of quartz particles and has a hardness of 3.0 (calcite). In form, the vessels are elongated with conoidal bases, poorly defined shoulders, and slightly flaring rims. Their color shades from tan to dark brown. The exterior surface is neatly simple-stamped with impressions extending in a horizontal or slightly diagonal pattern around the vessel. Decoration is absent. The ceramic collection from the site is, to my knowledge, distinct from any other published pottery description and I have assigned it to a new type, Truman Plain Rim.

Stone artifacts, found in association with the burial mound complex, were manufactured from raw materials that are abundant and easily obtainable in the Middle Missouri region. Projectile points associated with the burial complex were recovered from Mounds 3, 4, and 6. Four specimens were complete enough to be separated into descriptive groupings. Three of the points are small and were manufactured from various grades of whitish chalcedony. One point, from Mound 3, is triangular with corner notches, straight base, and straight sides. Another specimen, recovered from Mound 6, is triangular with side notches, straight base, and slightly convex sides. The third small point, also from Mound 6, is triangular with side notches, concave base, and straight sides. The workmanship on all three of the specimens is crude and haphazard. The fourth point, from Mound 4, is manufactured from a type of dark-brown chalcedony known in the Middle Missouri area as Knife River Flint. The specimen is a long, thin, triangular point with very slightly convex sides and side notches. The base is missing. The point is excellently fashioned and probably functioned solely as a grave offering rather than a utility implement.

Other stone artifacts associated with the burial mound complex include one Bijou Hills Quartzite end scraper, two knife fragments of plate chalcedony, and a third of white quartz. Also recovered were nine retouched chips of quartz, quartzite, chalcedony, and chert. Ground or partially smoothed stone implements are poorly represented and it is somewhat questionable as to whether or not they were purposefully altered for use. The archaeological significance of these artifacts may be determined when future investigations into this mound complex develop.

Artifacts of bone were located in four of the six mounds. Although positive identification of the osseous material was not possible, because of the degree to which it had been altered, the collection seems to be composed of bird and small mammal bone. Only a single awl appears to be from a rib of a deer or bison. The objects include six poorly fashioned, tubular beads; ten small, barrel-shaped beads, and one crude awl. The tubular beads were recovered from Mounds 2 and 3; the barrel-shaped beads are from

Mounds 5 and 6. All of the bone objects, except one, were located in direct association with the burials.

Worked shell specimens were recovered from all six mounds at the site. In each instance, except at Mound 2, the shell objects were in direct association with the human interments. Most of the specimens were manufactured from mussel shells easily obtainable in the streams nearby. Four shells from Mound 3 identified by Morrison "local fresh-water mussels" include one pendant and three spoons. One large tubular bead from Mound 4 was "cut from columella of an unidentified marine gastropod shell" according to Morrison. The majority, 86 of the shell specimens, consists of small, rather crudely-shaped disc beads that have been perforated near the center. It may be of some significance that more than half of these beads are coated with a hard, limey encrustation.

Cultural Affiliations and Conclusions

Burial mounds on the central and northern Great Plains have been a subject of inquiry for at least 100 years, but published information concerning mound excavations lags far behind the number of reports relating to other types of archaeological sites. A short review of some of the early reports concerning Indian burial mounds is of some interest here.

The first report of a mound excavation, to my knowledge, was written by Donald Gunn, an employee of the Hudson's Bay Company (Gunn 1868). He discusses an excavation into a mound containing one primary and several secondary human burials. The tumulus is located in the vicinity of Winnipeg, Manitoba. Unfortunately, Gunn's artifactual descriptions are of a very general nature. An article by A. J. Comfort, an army surgeon, is concerned with mounds and their contents near Sisseton, South Dakota (Comfort 1873). In my opinion, this is the first report of a systematic archaeological investigation in the areas under consideration. Judging from the excavation techniques, the detailed descriptions, and the objective interpretations, this most important paper far surpasses its predecessor and many of its successors for the next half century. In 1887, McCharles published a short article in which he discusses mound groups along the Souris and Red rivers and in the Lake Manitoba area (McCharles 1887). His site locations are fairly precise, but the artifact descriptions are too general to be of much value. Four significant papers concerning mounds in North Dakota, Manitoba, and Saskatchewan were written by Henry Montgomery, a Canadian (Montgomery 1889, 1906, 1908, 1910). His three latest articles are particularly interesting in that they are well illustrated with photographs of pottery, stone, bone, and shell artifacts. The 1910 report discusses excavations at the Calf Mountain Mound near Darlingford, Manitoba. This mound, 10 feet high and 80 feet in diameter, is one of the largest that I have encountered in this study. In 1890 George Bryce reported seeing some 60 mounds in the areas of the Rainy, Red, and Souris rivers (Bryce 1890). He opened ten of them. Artifact descriptions are very general and little is said regarding pottery. From his traverse, Bryce generalizes that all of the mounds which he saw were round or oval, located on prominent headlands, and generally contained skeletons. Later Bryce (1904) published a pamphlet containing three separate reports. The articles refer to excavations and the geographical distribution of artificial tumuli along the stream courses mentioned in his 1890 report. There are some photographic illustrations of artifacts in this paper; generally speaking, this pamphlet is somewhat more usable than Bryce's earlier article.

Cyrus Thomas (1894), in his voluminous report concerning artificial earthworks east of the Rocky Mountains, generalizes about the modes of burial found in mounds in the Dakota area. He states that bundle burials are found in pits and that burials found in a horizontal position on the original ground surface are always in stratified mounds. He also describes burials consisting of confused masses of bones. Thomas reports that mounds in the Dakota area frequently yield evidence of White contact.

During the early part of the 20th century and on into the 1940's, W. H. Over located and tested a multitude of sites in South Dakota. Unfortunately, much of his research concerning burial mounds remains in unpublished field notes, notably the Arbor Hill Mounds, Madsen's Mound, Ufford Mounds, Enemy Swim Lake Mound, and the Yankton Mounds. In 1933 George Will wrote a short summation of work done in North Dakota (Will 1933). He refers to tumuli near the towns of Linton, Dunseith, and Streeter, and 5 miles south of the Sheyenne River. Will alludes to single or

double burials in the mounds and states that the artifact contents are sparse.

Three of the most significant and comprehensive papers pertaining to archaeology on the central and northern Great Plains are those of Strong (1935, 1940) and Wedel (1940). It is of interest that, although the authors describe and discuss all of the important data regarding burial mounds known at that time, little is offered which suggests more than a very general cultural relationship to the Truman Mound site.

In all of the data that I have been able to examine, I have found little in the way of patterns or groups of traits that suggests close affiliations between the Truman mounds and other excavated sites. Nevertheless, certain features or artifacts which occurred at various other sites are quite similar to ones at the Truman Mound site. It must be noted, however, that these resemblances are isolated and that the comparable materials often occur, at their particular sites, in archaeological contexts quite different from that at the Truman mounds.

The terrace edge upon which the Truman Mound site rests is dotted with numerous other mound groups (Huscher and McNutt 1958). One of these, site 39BF270, is located about ¼ mile west of the Truman mounds (Fig. 1). It consists of four dome-shaped, earthen burial mounds, three of which I excavated in 1958. They were stratigraphically and structurally similar to the Truman mounds. Two of the tumuli contained secondary interments; the third had both primary flexed burials in deep subfloor pits and secondary burials in shallow pits. Unfortunately, the artifactual collection from 39BF270 was meager and identifiable pottery was lacking. Of the nonceramic artifacts, two small, triangular, side-notched projectile points from Mound 1 at 39BF270 compare closely with a specimen from Mound 6 at 39BF224. A bone awl, manufactured from a splinter fragment, was recovered from Mound 1 at 39BF270. It is almost an exact replica of the one found in Mound 3 at the Truman Mound site. Both specimens occurred in direct association with primary flexed burials of single individuals in deep subfloor pits. Another comparable artifact type is the small, tubular, bone bead. In Mound 1, at 39BF270, the beads were found in association with primary and secondary burials; in Mound 3, at the Truman site, they were less numerous and in association with the primary burial.

The Olson Mound (39BF223) is located about 1 mile east and along the same terrace edge as the Truman mounds (Fig. 1). The site consists of a single, low, domed tumulus that was partially disturbed by gravel quarrying operations. I excavated this mound in 1957. Once again, archaeological evidence for a cultural relationship between this site and the Truman site is hampered by the paucity of artifacts recovered. However, certain non-diagnostic resemblances are present. The Olson Mound is similar to the Truman in geographical location and construction; also, the size of the former (55 feet in diameter and 1.9 feet in height) falls within the dimensional range of the latter. Another similarity is seen between the secondary burial located in a shallow pit at the base of the Olson Mound and the secondary burial pattern at the Truman mounds.

The Split Rock Creek site, comprised of 38 low, dome-shaped mounds, is located just north of the junction of Split Rock Creek and the Big Sioux River in Minnehaha County, southeastern South Dakota. Two of the mounds at this site were excavated in 1921 (Myer 1922); later, in 1939, three additional mounds were excavated (Over and Meleen 1941). Mound 1, of the 1939 investigations, measured 50 feet by 40 feet and had a height of 2.5 feet. This tumulus contained a secondary human burial composed of four individuals deposited into a single subfloor pit. A feature of particular interest in this mound was the "occurrence of thirty small boulders, neatly arranged in the form of a rectangle that covered an area approximately 2 by 2.5 feet" (Over and Meleen 1941). The feature was located on the surface of the natural soil below the mound fill. This situation approximates, in description, the arrangement of cobbles found on the top of Mound 3 at the Truman site. Certain differences between these features are apparent, however. At the Split Rock Creek site, the stones are below the mound, and also, there is no mention of additional stones situated out from the sides of the rectangle as found at the Truman Mound site. Due to the relatively small number of artifacts recovered, the authors tentatively related the Split Rock Creek mounds to the Red River aspect, a Woodland manifestation in Minnesota.

More recently published literature on mound investigations is primarily concerned with those tumuli located in areas that will be, or have already been, disturbed by the construction of dams and reservoirs along the Missouri River and its tributaries. Two mound sites in the Fort Randall Reservoir, South Dakota, were excavated by a Smithsonian team in 1947 (Cooper 1949). Site 39CH4, the Wheeler Bridge Mounds, consisted of two low, circular tumuli, each having secondary burials in a rectangular pit. Most of the artifacts were recovered from the artificial fill in each mound. The White Swan site (39CH9) was a singular mound containing secondary burials and a rectangular pit. The interments in this mound, however, were not in the pit, but were "only in the fill and on the base of the mound" (Cooper 1949). Cooper notes certain resemblances between these mounds and Woodland sites in Minnesota and Nebraska. Similarities between the Fort Randall mounds and the Truman site are only superficial, notably one triangular, side-notched, straight-based projectile point, some disc-shaped shell beads, and a tubular-shaped shell bead from 39CH4 and 39CH9.

At the Scalp Creek site (39GR1), also located in the Fort Randall Reservoir, excavations were made into a small, stratified mound. Flexed human burials were located on the floor of the mound, but burial accompaniment was lacking (Hurt 1952 and 1953). Hurt assigns the mound to the Scalp component, which is the Woodland complex at the site, and suggests that it dates as early as A.D. 1000. At the present time, relationships between this mound and the Truman site are obscure.

In the Baldhill Reservoir area, east-central North Dakota, two mounds were excavated at site 32BA1 (Hewes 1949). Mounds A and B had central pits into which were deposited secondary burials. The pits were covered with timbers. Mound A had, in addition, a shallower grave containing primary interments. Hewes suggests close similarities between these and the Mitchell mounds in Davison County, South Dakota (Meleen 1938). In comparing the traits from the Truman and Baldhill mounds, the only close point of similarity is seen in the perforated, mussel-shell pendant from Mound A at 32BA1 and the specimen from Mound 3 at 39BF224.

The Eagle Creek site (25HT1) in Holt County, northeastern Nebraska, encompasses about 20 low, circular mounds, nine of which were excavated by the University of Nebraska. In his master's thesis, Raymond Price discusses the investigations at Eagle Creek and certain other sites in the area (Price 1956). Eight of the mounds at 25HT1 contained one burial pit each; one mound had two pits. He notes that the pits were characteristically irregular in size and shape. Within the graves were found secondary burials. Some of this skeletal material had been burned. Only one primary interment was located; it was flexed and in a pit at the base of the mound. None of the artifacts recovered at 25HT1 were found in direct association with the burials. Pottery types described from the site include the following Woodland variants: Feye Cord Impressed, Feye Cord Roughened, Valley Cord Roughened, Scalp Punctated and Randall Incised (for complete descriptions of these ceramic types see Kivett 1952 and Hurt 1952). Price defines the burial complex at the site as a Woodland component of the Loseke focus. I find no evidence of a close relationship between the Eagle Creek site and the Truman mounds.

Site 25KX6 is a mound site in Knox County, northeastern Nebraska. Seven of the 20 mounds at this site were excavated in 1937 (Price 1956). Two types of interments were revealed: secondary burials in circular, subfloor pits, and intrusive secondary burials. The subfloor pits contained disc-shaped shell beads, some with large and others with small perforations. Two sherds from one mound resemble the Valley Cord Roughened type of pottery. The intrusive interments were found in association with metal artifacts indicating White contact. The only point of comparison between the Truman mounds and site 25KX6 is in the presence of disc-shaped shell beads, and this trait is certainly not diagnostic.

At site 25KX8, also in northeastern Nebraska, Price reports that two out of ten mounds were excavated. One mound contained a secondary burial of one individual and sherds from a single vessel. The other mound had secondary burials and a few cord-roughened sherds. From the available data, similarities between this site and the Truman mounds cannot be ascertained.

In the preceding paragraphs, I have endeavored to present the available data concerning burial mounds and their excavations on the central and northern Great Plains. At the

onset of this study, I had hoped to find a site or sites whose traits would show a close relationship to the Truman mounds. Only one mound group, 39BF270, provided more than the most general similarities. Unfortunately, pottery, the most diagnostic trait at the Truman site, was not found at 39BF270. After examining the material from other reports, one important fact becomes apparent. The burial mound complex has a broad spatial and temporal distribution on the Plains. Artifactual inventories from the various sites indicate that the practice of mound burial extends from the Woodland, or early ceramic period into the time of White contact. Therefore, it is not surprising that a wide range of traits is manifested. As additional investigations of mound sites are reported, I am sure that the interrelationships between these mound cultures will be recognized.

In attempting to place the occupancy of the Truman Mound site (39BF224) into a temporal context, I am forced to use a rather indirect approach. The artifact inventory from the Truman Mound site appears most closely allied to material from Woodland period sites in Kansas, Nebraska and South Dakota. The most distinctive, non-Woodland trait at 39-BF224 is the simple-stamped surface treatment on the exteriors of the conoidal-shaped Truman Plain Rim vessels. All of the previously defined Woodland pottery types have twisted sinew or cord impressions applied to the exterior surfaces of the vessels. (It should be noted, however, that cord-paddled pottery is not limited to Woodland sites; it is also present on ceramics from sites of the more recent Plains Mississippi phase.) All other ceramic qualities of Truman Plain Rim, such as vessel size, shape, temper and color, resemble Woodland-period pottery. As to the stone, bone, and shell artifacts from the Truman mounds, they also show a marked resemblance to specimens from Woodland mound and camp sites (Kivett 1949, 1952, 1953). Three Woodland period sites in Kansas and Nebraska have been dated by radiocarbon methods. The Woodruff Ossuary (14-PH4) is in Phillips County, north-central Kansas (Kivett 1953). Carbonized material from the ossuary has been dated at A.D. 611± 240 years (Wedel and Kivett 1956). Site 25-FT18 is a village occupation in Frontier County, south-central Nebraska (Kivett 1949). The charcoal specimen submitted from this site was dated as A.D. 828±200 years. The Woodruff Ossuary and site 25FT18 are components of the Keith focus. A third Woodland occupation is the Kelso site (25HO23) in Hooker County, west-central Nebraska (Kivett 1952). An unpublished radiocarbon date from this site is given as A.D. 808±200 years (Kivett, personal communication).*

The simple-stamped impressions which mark the exterior surface of Truman Plain Rim pottery, suggest that the pottery is quite late within the Woodland tradition. The technique of simple stamping is thought to make its appearance on the Plains with the late prehistoric villages of the Mississippian peoples. It has been postulated that the technique appeared first in the North Dakota region and then spread southward (Lehmer 1954). Typologically, one of the earliest village sites in the middle Missouri area to have simple-stamped pottery is the Thomas Riggs site (39HU1) in Hughes County, central South Dakota (Meleen 1949; Hurt 1953). Most of the pottery from this site belongs to globular vessels having straight, flared or S-shaped rims. Loop or strap handles on these vessels are present, but rare. A charcoal specimen from the Thomas Riggs site has a date of A.D. 1228±200 years.

In conclusion, the Truman Mound site (39-BF224) seems to be a Woodland manifestation. The trait of simple stamping, found on the ceramics from the mounds, indicates that the site falls into the Late Woodland period on the Plains. I feel that the site dates no earlier than A.D. 800 (post-Keith focus) and no later than A.D. 1200 (pre-Thomas Riggs).

Acknowledgments. The Truman Mound site (39BF-224) was first recorded in 1956 by a survey team of the Smithsonian Institution, Missouri Basin Project, under Harold A. Huscher. Excavations at the site were conducted by field parties of the Missouri Basin Project during the summers of 1957 and 1958. I supervised all excavations. Russel L. Brown served as field assistant during the first season; James J. Stanek, in 1958. The entire project was a segment of the Inter-Agency Archeological Salvage Program of the Smithsonian Institution, the National Park Service, and a number of cooperating federal, state, and local institutions.

From the time that the archaeological material from the Truman site was excavated until this report was completed, numerous individuals contributed their patience

* The sample of charred wood (M–637) from the Kelso site was dated at the laboratory of the Michigan Memorial–Phoenix Project, Number 6, under the direction of H. R. Crane.

and skilled efforts. I am particularly grateful to the 14 men who worked at the site; their cooperation was unfailing. Dean Clark supervised the washing, restoring and cataloging of all of the specimens; this was no little accomplishment considering the quantity and condition of the skeletal material. Herman Harpster skillfully photographed the individual specimens and finished plates. Colleen Law drew all of the illustrations and assisted greatly in the choice of elements for representation. The typing was done by Yvonne Vantiger, who also did her utmost to correct innumerable mistakes in grammar and spelling. Evelyn Stewart generously aided the author in preparing the plates.

Archaeologists Robert L. Stephenson and Charles H. McNutt of the Missouri Basin Project, and Marvin F. Kivett of the Nebraska State Historical Society, were kind enough to read the manuscript. I am indebted to them for their most valuable suggestions and criticisms. William M. Bass, physical anthropologist at the University of Pennsylvania, identified the human skeletal remains. The shell specimens were identified by Joseph P. E. Morrison of the United States National Museum.

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FACTS AND COMMENTS

BURINS FROM TEXAS

JEREMIAH F. EPSTEIN

ABSTRACT

Burins have recently been discovered in several Texas sites, in Central Texas, associated with Angostura points and in the Trans-Pecos area, in a Desert Culture context. A few parallels are seen with Alaskan burins. The data indicate that in Texas, burins are part of the paleo-Indian and Archaic complexes. There is also a possibility that they were made as late as the 16th century along the Rio Grande.

BURINS have been considered a significant trait of many early lithic complexes in northern North America ever since Giddings (1951) discovered them at Cape Denbigh. Within the past year burins have also been recognized in the Archaic and paleo-Indian cultures in the Trans-Pecos and Central parts of Texas.

THE PECOS RIVER AREA

Recently 47 burins were obtained from two small rock shelters along the Rio Grande, just south of Langtry, Val Verde County (compare Schuetz 1956). These shelters were excavated from October to December of 1958 as part of the Texas Archeological Salvage Project's program for the Diablo Dam area. This region is well known for its abundant rock shelters, elaborate pictographs (Jackson 1938), and excellently preserved perishable material (Martin n.d.). All of the archaeological remains from the area are considered part of the Pecos River focus (Sayles 1935; Kelley, Campbell, and Lehmer 1940; Suhm and Krieger 1954) which is a variant form of Desert Culture (Jennings and Norbeck 1955). Kelley (1959) has recently summarized the prehistory of the Pecos River area and pointed to its relationships with other Archaic and Desert cultures in and out of Texas.

Our two shelters were named Damp Cave and Centipede Cave. Twenty-six burins came from the former, 21 from the latter. They are more or less evenly distributed throughout the deposits of both sites. Most of the burins were made from oval flakes taken directly from the core without using a prepared striking platform. A few were produced from broken or discarded scrapers. The prevailing type is a *burin bec de flute* in which the engraving end is formed by the intersection of two burin facets. Less common examples are formed by the intersection of a burin facet with a hinge fracture or scraping edge. Only a few specimens are double pointed, and all show moderate use.

The burins appear to have been formed by two different techniques since the spalls range in length from 0.5 to 7.0 cm. Presumably the larger spalls are removed by percussion and the smaller by pressure (Noone 1934). The burins in our collection were produced apparently by either of these techniques used alone or in combination. The finer, more needle-tipped specimens however were formed only by the pressure process.

Particularly interesting are the worked burin spalls. Our sample consists of over 50 rectangular and triangular spalls, ranging in length from 2.5 to 7.0 cm., that show retouching and fine use scars. One example has even had a fine burin spall removed from it and may be termed a "burinated burin spall." In general, the worked spalls are strikingly similar to the burin-spall artifacts from Cape Denbigh (Giddings 1956), but the Alaskan specimens are, of course, much smaller.

There is a final grouping of burin-like tools that I am provisionally calling "angle gravers." These artifacts are all made from oval flakes, similar to the kind used so often in the true burins, but they lack the negative bulb of percussion at the engraving tip which is a diagnostic feature of the latter. I suspect that in some of the angle-gravers, burin blows were delivered at the base, rather than at the tip of the piece. This procedure would be the simplest way of initially shaping an oval flake for use as an engraving tool.

A representative sample of Pecos River focus burins is shown in Figure 1. Percussion spall scars are indicated by heavy arrows; lighter arrows show pressure spall scars. Examples of burins produced by the pressure technique are Figure 1 *a–c*. In Figure 1 *a*, the engraving tip is formed by a single pressure blow down the right margin of the flake; the left margin is the hinge fracture of the original flake. Multiple pressure spalls have been taken from the needle-pointed *burin bec de flute* shown in Figure 1 *b*, *c*. The points of these two pieces have been enlarged to illustrate the number of spalls visible on them. Particularly interesting is the misdirected burin blow visible in Figure 1 *d*. The resulting flake, rather than burin spall, glanced off the right side of the top surface instead of down the right margin as was originally intended. Some specimens (Fig. 1 *e–g*) are combination percussion-pressure burins, while others (Fig. 1 *h*, *j–l*) are percussion produced. Two burins (Fig. 1, *j*, *k*) were sent to Giddings for identification in May, 1959, and were typed by him as a *burin bec de flute* and an angle burin respectively. Examples of worked burin spalls are seen in five specimens (Fig. 1 *g*). Two of the pieces provisionally called "angle gravers" are shown in Figure 1 *i*, *m*. It should be apparent that the pressure-produced burins (Fig. 1 *a–c*) are nothing more than angle gravers secondarily sharpened by pressure. It is perhaps most significant that gravers of the American type are rare in our collection from Centipede and Damp caves.

Since the burins appear in small but essentially unchanging proportions throughout the deposits of both shelters, our immediate concern is with the terminal dates of the Pecos River focus. An excellent three-horizon lithic sequence obtained from Centipede Cave points to a relatively long occupation extending from about 4000 B.C. to almost the historic period. The sequence is best understood in terms of the contrasting percentages of contracting-stem and side-notched dart points. The earliest horizon is dominated almost completely by con-

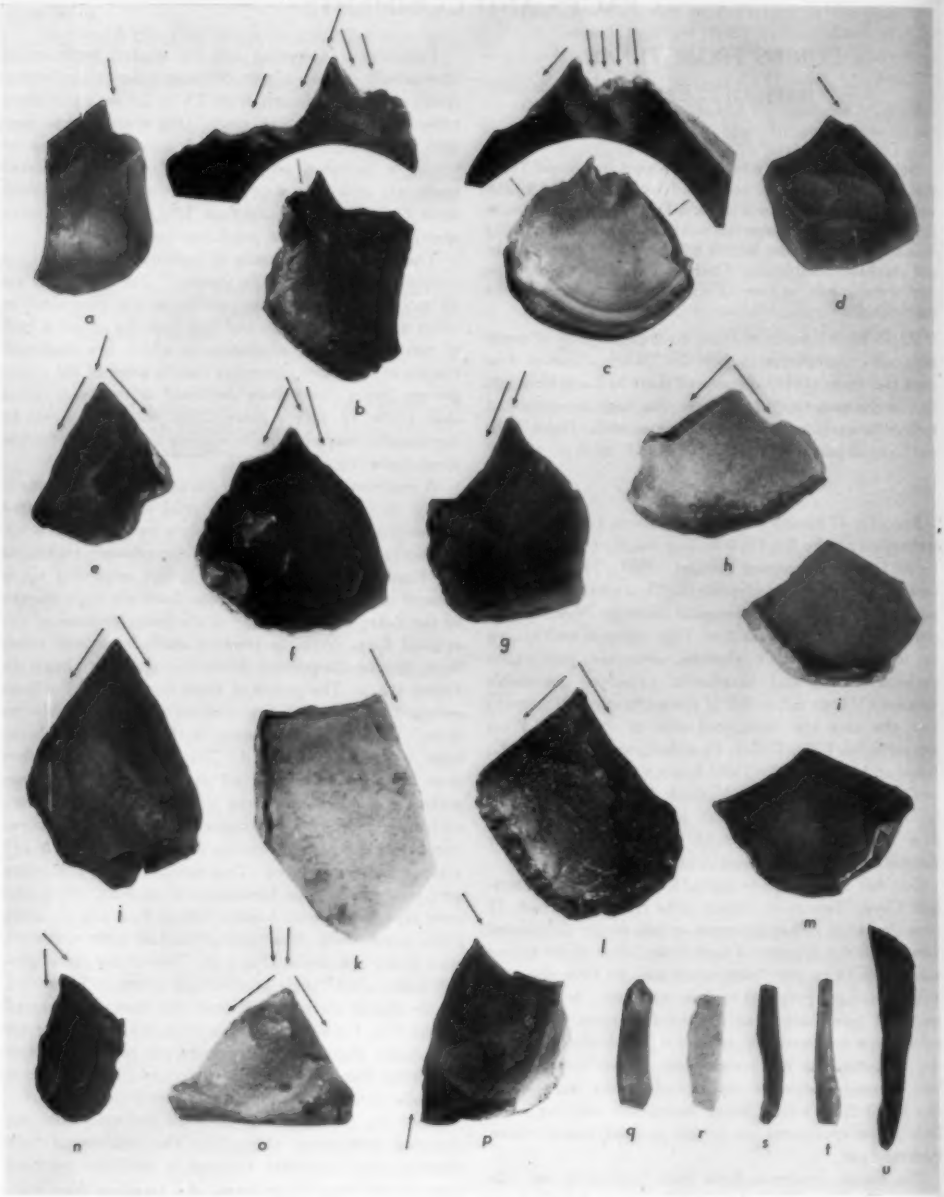

Fig. 1 [Epstein]. Burins, burin-spall artifacts, and angle gravers from various sites in Texas. *a–h*, *j–l*, burins from Centipede and Damp caves, Val Verde County; *i*, *m*, angle gravers from Damp Cave, Val Verde County; *n*, burin from Presidio County; *o*, burin from La Perdida site, Starr County; *p*, burin from Levi Rock Shelter, Travis County; *q–u*, burin spall artifacts from Damp and Centipede caves, Val Verde County. Short arrow indicates pressure spalls; long arrows, percussion spalls. Length of *u*, 5 cm.

tracting stemmed points of Almagre, Langtry, and Shumla types (Suhm and Krieger 1954: 396, 438, 504, Pls. 77, 98, 119). The following or intermediate horizon sees a marked reduction of these types, and an increase in the side-notched points of Ensor and Frio types (Suhm and Krieger 1954: 422, 428, Pls. 90, 93). Arrow points of Cliffton and Perdiz types (Suhm and Krieger 1954: 496, 504, Pls. 127, 131) appear now for the first time. In the latest or most recent horizon, contracting stemmed points are virtually absent, side notched points dominate the scene, and the arrowpoint types seen earlier increase slightly in frequency.

In view of the fact that the latest horizon contains a fair number of Perdiz and Cliffton arrowpoints, there is a good possibility that the top levels are coeval with the historic period (Kelley 1955: 942). Dating the base of the sequence is more difficult. The only radiocarbon date for Pecos River focus material comes from Eagle Cave (Schuetz 1957) where charcoal from Zone B dated at 2593 B.C. ± 130 (O–317, 4550 ± 130 years ago as of May 1957). Although the data are not conclusive, there is reason to believe that Zone B of Eagle Cave is roughly contemporary with the intermediate horizon of Centipede Cave, and so I suspect that the lower horizon at the latter site began considerably earlier. Taylor has suggested that the Pecos River focus is similar to the Middle Coahuila complex at Frightful Cave (Taylor 1956: 220–23). The most recent date for this complex is 4215 B.C. ± 300 (Crane and Griffin 1958, M–189, 6170 ± 300 years ago as of 1955). For the moment at least I see nothing against assigning a tentative base date for the Pecos River focus at about 6000 years before the present. I am thus provisionally equating the lowest horizon at Centipede Cave with the Middle Coahuila complex at Frightful Cave. If these terminal dates for the sequence at Centipede Cave are correct, then burins were made and used in the Pecos River focus from about the beginning of the 5th millennium before Christ to the 16th century of the Christian era.

The Big Bend Region

Two burins are known for the Big Bend country in southwestern Texas. In what may be the earliest reference to a burin in the New World, Campbell (Kelley, Campbell, and Lehmer 1940: 114) observed: "One scraper of whitish chert (Plate XVII, b, 8) appears to show a combination of functions. Its point is formed by a classic European graver stroke, giving a chisel-like edge. Minute chipping at places on this point suggests use as an engraving tool." Examination of the photograph shows this specimen to be unlike the burins from Centipede and Damp caves. The flake from which it was made is prismatic, with convex sides, and apparently had a prepared striking platform. Such flakes are rare in the Pecos River area.

This burin came from the Maravillas complex at the Calamity Creek site, and is part of a small assemblage of stone tools in which points similar to the Shumla type and mano and metate fragments are perhaps the most significant. The complex lies on the contact zone between the heavily eroded Neville formation and the overlying Calamity formation. Since the Neville is believed to have eroded during the Altithermal period (Albritton and Bryan 1939) which may have lasted from 7500 to 4000 years ago (Antevs 1955) the complex should not be older or younger than the estimates above. It is impossible at present to narrow these dates more precisely, and so the Maravillas complex could either be earlier than or contemporary with the lowest horizon at Centipede Cave. In the Big Bend, the Maravillas complex underlies the Pecos River focus (Kelley, Campbell, and Lehmer 1940, Pl. 19), but there is not enough information at hand to demonstrate that this same relationship applies to the lower Pecos River area 200 miles to the east.

The other burin (Fig. 1 *n*) came from a rock shelter in Presidio County, near Marfa. It was brought to my attention by James Pegg, a geology student at the University of Texas. Because of its resemblance to Alaskan specimens it was sent to Giddings who identified it as a *burin bec de flute*. Especially interesting is the fact that, unlike the unifacial burins described earlier, this specimen is bifacial, apparently a reworked tool, and within the range of Alaskan (Giddings 1951, Fig. 60 *a*, 2) and Greenland (Collins 1953, Fig. 3 *g–l*) forms.

At present little can be said of the two burins from the Big Bend country other than that they do not follow patterns observed for burins of the Pecos River focus.

Southwest Texas

From La Perdida, a blow-out or exposed site about 10 miles north of Rio Grande City, Starr County, comes the burin shown in Figure 1 *o*. The site is of interest because surface finds include Clovis, Scottsbluff, Plainview, Meserve, and Angostura points as well as types belonging to the Pecos River and Meir foci (Weir 1956). The burin is shaped like an equilateral triangle. The graver end was first formed by two percussion blows and then resharpened by pressure. The hinge fracture of the original oval flake serves as its base in contrast to the boulder end in the Pecos River focus specimens.

Panhandle Plains Area

Some comment is necessary regarding the four possible burins from the Scharbauer Site near Midland (Wendorf and others 1955: 50). I share the authors' doubt that the pieces are true burins, since even the most likely specimen (Wendorf and others 1955, Fig. 13, *8*) shows no negative bulb of percussion, or conforms to our own or Alaskan specimens in shape or form.

Central Texas

Thirteen burins have recently been obtained from the Levi Rock Shelter, which fronts Lick Creek, a tributary of the Pedernales River near Austin. The site is currently being excavated by Herbert Alexander, a graduate student at the University of Texas who has allowed me to use his data. [See Addendum — Editor.]

Except for the top 6 inches, the whole deposit at the Levi Rock Shelter appears to be pre-Archaic. Since exca-

vations are still in process, it is impossible to characterize the total cultural assemblage, but so far the artifacts below the top 6 inches include 16 Angostura points and point fragments that are intermediate in shape between Wormington's Angostura and Agate Basin types (Wormington 1957, Fig. 71, *1–2*). An unusual find was a crude polyhedral core. Thirteen burins have come from the site as well as a number of burin spalls. These appear throughout the deposit and it is impossible to determine at present whether they are proportionately more frequent in any one level or zone.

Five of the 13 burins are of the *bec de flute* type, three are formed by the intersection of a burin facet with a scraping edge, and the remainder are formed by the intersection of a burin facet with a hinge fracture. One specimen, a *burin bec de flute*, was made from a discarded bifacial tool, probably a point. The group shows little uniformity. All are made from crude, oddly shaped flakes. The spalls vary in length from 1.0 to 8.0 cm. The burin illustrated in Figure 1 *p* is double pointed and seems to have been made by the pressure technique.

At present the only dated Angostura points in the United States are from the Ray Long site in South Dakota (Hughes 1949). There are two groups of radiocarbon dates from the site (Wormington 1957: 140). The most recent readings came from charcoal samples taken from an area thought to be coeval with the artifacts, and were dated at 7715±740 and 7073±300 years ago (Libby 1955, C–454, C–604). The other sample consisted of charcoal specks obtained from the zone in which the points were found and gave a date of 9,380±500 years (Crane 1956, M–370). If the paleo-Indian deposit of the Levi Rock Shelter should prove contemporary with even the most recent dates from the Ray Long site, then the burins from the Levi Rock Shelter are probably earlier than those from the lowest levels at Centipede Cave, and the single specimen from the Maravillas complex at the Calamity Creek site. The dating problem however, is complicated by the possibility that Angostura points may have survived after 4000 B.C. in Texas (Suhm and Krieger 1954: 402).

Conclusions

While burins have been reported from the states of Washington (Cressman in Wormington 1957: 186–7), Virginia (Miller 1956), and Tennessee (Kneberg 1957: 60) in paleo-Indian contexts, they and the lithic industries associated with them have been only briefly noted. Until more detailed reports are available, it is necessary to go to Alaska and Canada for comparisons. The limitations and dangers of this procedure are obvious.

MacNeish (1954: 252) points out that two distinctive but related lithic patterns existed in northern North America. One, often called Paleo-Eskimo, appears along the Arctic coast. The other belongs to the interior of northwest North America (British Columbia, the southern Yukon, eastern part of the Northwest Territories of Canada, and central Alaska) and is characterized by large projectile points, choppers, crude scrapers, and crude angle and corner burins. Although the Texas burins show a diffuse typological resemblance to those from northern North America in general, slightly greater parallels are seen with those of the interior. The burins from the Pointed Mountain site (MacNeish 1954, Fig. 66) and the Flint Creek complex at Engigstciak (MacNeish 1956, Pl. 1, *9–11*) are similar in size and crudeness to most of the burins so far known for Texas, and it may be more than coincidental that the Flint Creek complex and the Levi Rock Shelter both share burins and Angostura points.

There are also similarities between the Texas and Paleo-Eskimo material from the Arctic coast. The burin from an unexcavated shelter in Presidio County is markedly similar to those from Cape Denbigh and Greenland, while the burin-spall artifacts from the Pecos River focus resemble in form the smaller specimens from Iyatayet and the Cape Denbigh-like New Mountain complex at Engigstciak.

While these parallels might indicate a genetic relationship between the two areas on a paleo-Indian time level and later, it must be emphasized that few one-to-one correspondences exist. Alaskan burins, for the most part, resemble the Texas only in their crudeness, and the lithic complexes associated with burins in the north are largely unreported for Texas. In the north, burins are found with microblades and polyhedral cores. In Texas, microblades are unknown, and polyhedral cores are exceedingly rare — the single crude specimen from the Levi Rock Shelter is most exceptional. The association that seems most significant at this writing is the presence of burins and Angostura points both at the Levi Rock Shelter and in the Flint Creek complex at Engigstciak. Whether this juxtaposition is accidental or not remains an open question until further research is accomplished. Obviously, collections from sites containing Angostura and other paleo-Indian points should be reexamined for burins (and microblades and polyhedral cores as well). A similar reappraisal must be made for the lithic industries of Desert Culture sites.

The fact that burins appear in a Desert Culture context in Texas is in striking contrast to the association of burins with the large game hunting cultures in the north. It is generally assumed that burins are tools designed for splitting and engraving bone. These functions could have little application in the Pecos River focus where our excavations yielded few deer bones and a plethora of fish and rodent remains. Clearly burins, like screwdrivers, are multi-purpose tools. To the people who lived a Desert Culture existence along the Rio Grande, burins may have been more valuable in woodworking, and certainly useful in splitting reeds for basketry. Here the essential engraving function of the burin would be retained even though the medium for which it was originally intended had changed. I am assuming, therefore, that the Desert Culture burins in Texas are survivals from a still older paleo-Indian hunting economy.

Addendum

Since the above was written, the excavations of the Levi Rock Shelter have been completed, and Alexander has defined the cultural stratigraphy at that site. Burins appear throughout the deposits. The specimen illustrated in Figure 1 *p* is not associated with Angostura points, as previously stated (*American Antiquity*, Vol. 25, No. 3, p. 447), but appears instead in a zone immediately below the Angostura material. This zone contained three point fragments; one is unfluted, the other two are not in the Angostura tradition. The zone is radiocarbon dated at 10,000±175 years B.P. (Humble Lab.), and so the burins found in it are, at this writing, the earliest burins known in the New World.

Acknowledgments. I wish to express my sincere appreciation to J. L. Giddings for identifying a number of the burins described here, and to T. N. Campbell and E. Mott Davis for their many helpful suggestions during the preparation of this report.

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A NOTE ON THE LAKE EL'GYTKHYN FINDS*

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Abstract

Two Russian publications provide new information about the sites on Lake El'gytkhyn in the Chukchi Peninsula: a detailed description of the lake, a discussion of its

* Translated and edited by Chester S. Chard.

origin, summary description of 33 blades from the craftsman's hoard, and 13 objects from the campsite. The fine classification of the blades is criticized and the identification of some of the other tools is questioned.

ADDITIONAL information on Lake El'gytkhyn and the archaeological materials recovered there is provided by two publications in Russian which supplement the article by Okladnikov and Nekrasov in American Antiquity (Vol. 25, No. 2, pp. 247–56, 1959). It should be noted that the latter is a slightly abridged version of the Russian original.

In the serial publication, *Problemy Severa*, Vyp. 1 (Moscow, 1958), there appears on pages 360–70 an article by I. A. Nekrasov entitled "An Expedition to Lake El'gytkhyn" which gives a detailed description of the lake and considers the question of its origin. The finds of stone artifacts are briefly mentioned.

An article by A. K. Saiapin and N. N. Dikov, "Ancient Traces of the Stone Age on Chukotka: Finds on the Shore of Lake El'gygytgyn," was published in Vyp. 1 of the *Zapiski* of the Chukotka Regional Studies Museum (*Chukotskii Kraevedcheskii Muzei*), Magadan, 1958. [This publication will be summarized, with illustrations, in forthcoming numbers of the *Anthropological Papers of the University of Alaska*—Translator.] The article describes a part of the stone artifacts discovered in 1955 by I. A. Nekrasov, A. K. Saiapin, and L. D. Bubentsov at Lake El'gytkhyn. The authors describe in summary fashion 33 stone blades from the craftsman's hoard, dividing them into six types. However, it is impossible to agree with their interpretation of these blanks as finished tools, nor will their classification of them into six types bear criticism. Also published in the article are 13 objects from the campsite on the shore of the lake: chips, a crude burin (polyhedral, with retouched "handle") showing similarities with forms from Yakutia, two blanks with facets recalling burin facets, lamellar blades, and a fragment of an artifact with diagonal retouch which is incorrectly described as a "trapezoid." In addition, there is a summary description of finds in one of the saddles among the hills southeast of the lake: "several scrapers, a percussion instrument in the form of a blade, and also a blank for an ax." What the authors call large scrapers (*skreblo*) are evidently big chips struck directly from pebbles; the Yakut term for them is *kuochai*. This latter site can scarcely be considered as of any antiquity.

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NELSON'S STRATIGRAPHY

Richard B. Woodbury

Abstract

The immediate stimulus for N. C. Nelson's stratigraphic technique in the Galisteo Basin, New Mexico, was his participation in 1913 in Obermeier and Breuil's excavations in Castillo Cave, one of the most famous of the Spanish paleolithic sites.

WHEN THE HISTORY of the diffusion of archaeological concepts between the Old World and the New is written, the relatively late adoption of stratigraphic excavation as a standard technique in America will deserve attention. N. C. Nelson has generally been considered responsible for making this method known to a wide circle of field workers here, as I recently pointed out (Woodbury 1960). Nevertheless, the technique was already familiar in the Old World and had been occasionally employed in the New (Adams 1960; Gamio 1959).

Nelson was prevented by illness from adding any comments to my discussion of the subject in this journal, but a subsequent letter from him is of sufficient interest to note here. He writes (personal communication, Feb. 2, 1960):

> . . . my chief inspiration to search for chronological evidence came from reading about European cave finds; from visiting several of the caves, seeing the levels marked off on the walls, and in taking part in the Castillo Cave in Spain for several weeks in 1913.

There was ample reason for American archaeologists to be interested in the rapidly growing body of information from Europe's great paleolithic sites. MacCurdy was installing a "hall of European prehistoric archeology" for the American Museum of Natural History in 1911 (Anonymous 1912: 209). In 1912 one of Nelson's colleagues at the American Museum, Henry Fairfield Osborn, visited many famous French and Spanish caves, including Castillo, where Obermeier and Breuil were then excavating. He describes the cave enthusiastically in *Men of the Old Stone Age*, in the preparation of which he was substantially assisted by Nelson (Osborn 1918: x). Osborn (1918: 162, 165) writes:

> The deposits which filled this grotto to a thickness of 45 feet from the floor to the roof were explored by Obermeier, who found them divided into thirteen layers, covering eleven periods of industry and presenting the most wonderful epitome of the prehistory of western Europe from Acheulean times to the Age of Bronze, in Spain. . . . This station . . . is a monumental volume of prehistory, read and interpreted by the archaeologist almost as clearly as if the whole record were in writing.

It should be noted, however, that the clear and impressive stratification of these cave deposits gave Nelson the inspiration rather than the exact model for his subsequent work in the Galisteo Basin of New Mexico, where he divided the deposits into arbitrary levels rather than depending on observable discontinuities. And even more important than Nelson's specific accomplishments was the rapid spread of his innovations, at first particularly to archaeologists in the Southwest, but eventually to every part of the New World.

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MANUEL GAMIO AND STRATIGRAPHIC EXCAVATION

RICHARD E. ADAMS

ABSTRACT

Use of the stratigraphic technique in American archaeology would seem to have been initiated by Manuel Gamio in 1911 at Atzcapotzalco, Mexico.

IN REFERENCE to the history of stratigraphic technique in new world archaeology, a mistaken impression is given by Woodbury's recent note (1960) that Nels Nelson's was the earliest use of the method. This note is not to disparage Nelson's deservedly commended work as a pioneer, but as a matter of historical interest, Manuel Gamio in Mexico had used the technique three years prior to Nelson's 1914 excavation. It is unfortunate that Gamio's achievement did not receive widespread recognition at the time.

In 1911 Gamio returned to Mexico from Columbia University and began work with Franz Boas who had been most instrumental in setting up the School of American Archaeology the previous year. Boas had amassed an enormous surface collection of pottery from sites in the Valley of Mexico which he had broken down into three typological groups; Tipo del Cerro (later named Archaic), Teotihuacán, and Aztec. He strongly desired to confirm this sequence and recommended to Gamio that the best means to accomplish this would be by stratigraphic technique in excavation. Consequently, Gamio undertook to dig an extensive series of test pits at Atzcapotzalco, excavating in 25 cm. levels. Material was segregated according to level, and percentage charts and graphs were drawn. This procedure enabled Gamio to confirm Boas' sequence and to set up the initial cultural sequence for the Valley of Mexico. The work was partially published in 1912. Unfortunately, this report only includes data on pits which were dug in variable levels: 20 cm. deep to the 80 cm. level and then deepening levels (to 1.75 m.) to the bottom of the pits. While not methodologically rigorous, even this work shows unusual control of the excavation. A manuscript on deposit in the Peabody Museum, Harvard University, relating to the same excavation shows that the rule during this series of excavations was 25 cm. levels from beginning to end. Gamio himself has alluded to the circumstances of excavation in a recent paper (1959), but with characteristic modesty has not pointed out the priority of his use of the technique.

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HARVARD UNIVERSITY
Cambridge, Mass.
February, 1960

PORCUPINE QUILL FLATTENERS FROM CENTRAL UNITED STATES*

ROBERT W. NEUMAN

ABSTRACT

Quill flatteners from Wisconsin, Minnesota, North and South Dakota, Montana, and Wyoming, which are attributed to Menominee, Sioux, Arikara, Blackfeet, and Arapaho, are described in four groups. Iron, S-shaped flatteners date from the period of European contact and trade, and two types of antler and horn flatteners are believed to have been made during the same time period. The only prehistoric or archaeological specimens are in the fourth group of flatteners made of long, thin pieces of mammal bone with rounded ends.

ONE OF THE most interesting topics relative to the American Indian is the technique of porcupine quillwork. Nearly every writer upon the subject has dealt with the various aspects of the technique such as the gathering and selection of the quills, the geographical distribution of the decorative patterns and styles, and the social, economic, and religious implications of quillwork among the various Indian tribes. Those writers, who were sufficiently skilled in the identification of plants, have given us data concerning the origin of the native dyestuffs used to color the quills. Unfortunately, one aspect of this decorative craft seems to have been neglected or at least insufficiently described, the tools involved in the art of quillwork. Rather vague references are made to the use of awls and quill flatteners, but rarely are these tools adequately described. It is a well-known fact that porcupine quillwork existed for a considerable

* Submitted with the permission of the Secretary of the Smithsonian Institution.

length of time among various Indian tribes before the coming of the White man, and during the contact period until it was generally replaced by beadwork about 1880.

Quillwork specimens from archaeological sites, especially on the North American Plains, are rare. However, there seems to be a good possibility that the implements used in quillwork may be found in the excavations. Certain archaeological specimens, designated as quill flatteners, have been questioned and alternative uses suggested (Wheeler 1956). This short paper is concerned with four different kinds of historically authenticated flatteners.

During the summer of 1958, I directed a crew of local Indians while carrying out archaeological investigations on the Crow Creek Indian Reservation in central South Dakota. The eldest of the workmen, a Lower Yanktonai Sioux, about 56 years of age, presented me with a gift that he called *páhiŋ ipadaye*, meaning quill ironer or presser. Frankly, I had no idea of what the tool was or how it was used. It was made from a handwrought piece of iron and shaped like an integral sign or an elongated S (Fig. 1 *a*). The mid-section or handle is rounded and decorated with crude line incisions. The two ends are

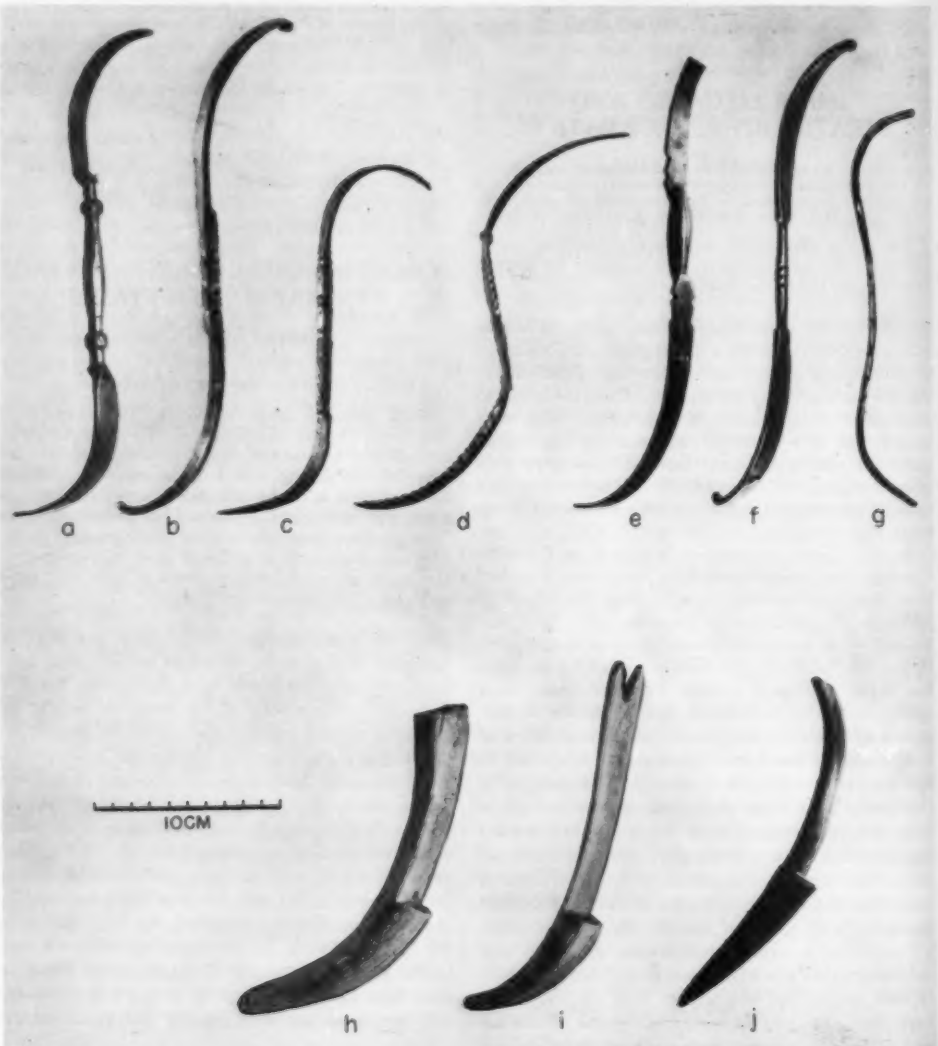

Fig. 1 [Neuman]. Quill flatteners from central United States.

flat and lack decoration. One end of the tool appears to have been heated; however, when questioned about the application of heat, the Indians denied knowing of any efforts to do this. There are no trademarks on the flattener and the only indications that I have, regarding its age and origin, are that the tool belonged to this Indian's mother-in-law, who was about 70 years of age, and had lived on the Crow Creek Reservation all of her life.

A short time later, I acquired another quill flattener belonging to a Sisseton Sioux from Sisseton, South Dakota. It is similar to the first specimen in all respects except that it is more elaborately decorated (Fig. 1 *b*). The handle is four-sided and bears a series of parallel, horizontal, and crossed diagonal incisions. At one end of the tool, the tip is curled back to form a small loop.

Upon termination of the 1958 field season, I returned to Lincoln and began attempting to collect additional quill flatteners. Many questions were asked of people who came from the localities where the tools were acquired and some correspondence was resorted to, in hopes of obtaining data on quill flatteners. The majority of the inquiries received negative answers. However, a few of the letters were rewarding and additional specimens were sent to me. Carlyle Smith of the University of Kansas sent me an S-shaped quill flattener that he acquired from "a Yanktonai by the name of White Face, at Fort Thompson, South Dakota in August, 1950" (Fig. 1 *c*). This specimen is more elaborately decorated and about ⅓ smaller in size than any of the other metal quill flatteners. Marvin Kivett of the Nebraska State Historical Society loaned me two metal quill flatteners which had originally been donated to the museum by a doctor who acquired them while living on the Rosebud Indian Reservation in south-central South Dakota (Fig. 1 *d*, *e*). These specimens are similar to the other flatteners, differing only in their degree of ornamentation.

Although published references concerning quill flatteners are scarce, Burton Thayer (1944) illustrates two iron quill flatteners from Prairie Island, Minnesota. One is quite similar to the specimens just mentioned; the other is shaped like an elongated C. This specimen was manufactured by amalgamating two iron knife blades. It is the same size as the other specimens and is decorated to suit the individual tastes of the manufacturer. Thayer states that "as a final process, these flatirons were heated and the quillwork was actually ironed under pressure to produce a smooth overall surface." This is the only reference that I have encountered which mentions the employment of heat in the quillworker's craft. Thayer also sent me an illustration of an additional S-shaped quill flattener. It had belonged to an Indian agent who resided at Fort Yates, North Dakota, for some years prior to 1900. It is similar to the previously mentioned specimens, differing only in its style of decoration.

Subsequently, I received some photographs of two other quill flatteners from the State Historical Society of North Dakota. There were no data regarding these specimens other than that they were obtained from an Indian at Fort Yates, North Dakota. One flattener is similar to the other S-shaped specimens except in its decoration (Fig. 1 *f*). The second flattener is made from a single piece of metal, but unlike the other specimens, it is shaped like an elongated, open C with a gentle inward curve along the middle portion of the tool (Fig. 1 *g*).

In all, I have data on ten metal quill flatteners; eight of these tools are alike in shape and manufacture, but each differs in the style and degree with which it has been decorated. The ninth specimen is similar to the other eight in all respects except that it is shaped like an elongated C and has been made from two pieces of metal. The tenth quill flattener is also shaped like an elongated C; however, it has an inward curve along the middle or handle area. These specimens are from North and South Dakota and Minnesota. I have no positive proof regarding their date of manufacture, but I believe that this type of tool was being produced at least by the end of the first half of the 19th century. This hypothesis is partially based upon the assumption that these tools were popular during the post-contact times when the technique of quillwork was still an active craft.

The second group of quill flattteners is from the Blackfeet Indian Reservation in northwestern Montana. They are the property of the Museum of the Plains Indian and were loaned to me by Thomas Kehoe, then curator. The first specimen is made from the tine portion of an elk antler (Fig. 1 *h*). The distal half serves as the handle; the working end has been thinned from the convex face so as to produce a flat surface with which to press the quills after they have been sewn in place. Decoration consists of crossed-diagonal incisions and three parallel incised lines encircling the handle. The entire tool has ben colored a light orange by the application of an unknown dye or pigment.

The second quill flattener (Fig. 1 *i*) is made from the tine portion of a deer antler. In shape, it is very much the same as the first specimen. However, it is more elaborately decorated with a series of incised lines and small drilled holes. A large V-shaped notch has been cut into the proximal or working end of the tool, the function of which is unknown. The only information that I was able to gather, regarding the origin of these quill flatteners, is that they were donated to the museum in 1941. They were the property of a woman whose father had traded with the Blackfeet Indians on this reservation.

The third specimen (Fig. 1 *j*) in this group resembles the other two in most respects except that it lacks decoration. It is made from the distal portion of a buffalo horn and has a smooth, glossy surface finish. The flattener was owned by "Bird Woman," presumably a Blackfeet Indian, and was purchased from the reservation Craft Shop in 1941. This is the same implement that is illustrated by Ewers (n.d.).

Although quillwork was widely practiced in Wisconsin, Minnesota, and parts of Michigan and illustrated specimens are common in the published reports, only one author describes and presents a photograph of a quill

flatttener (Skinner 1921). This Menominee flattener was made from the proximal portion of a deer antler. The burr section is unaltered and acts as the working end to flatten the quills. The beam serves as the handle, and two branching tines are decorated with carvings of "the totem birds of its owner." The specimen is five inches long. Skinner calls it a "quill iron," and states that it was used to smooth the quill embroidery after sewing.

In searching through the specimen boxes at the Lincoln office of the Smithsonian Institution, I located two antler artifacts that retain their burr sections. On each, the burr is smooth and worn, but neither implement is decorated. Although these two artifacts are of a very generalized nature and probably acted as multi-purpose tools, the Menominee specimen assists in interpreting at least one use for this type of artifact.

The specimens in the fourth and last group of quill flatteners are shaped from long, thin pieces of mammal bone that are generally rounded at both ends, ranging from 13 to 27 cm. in length. The handle portion and both faces may be decorated with incised lines or carved motifs. Six of these specimens are illustrated by Wedel (1955) who suggests that they are associated with female employment because they were part of the burial furniture recovered from female interments. The specimens are attributed to the Arikara Indians. Interestingly, one of the flatteners has a V-shaped notch cut into one end which is reminiscent of the notch on one of the quill flatteners from the Blackfeet Reservation. The seventh specimen in this group closely resembles the other six. It is illustrated by Kroeber (1902), and by Lowie (1954) who states that it is an Arapaho implement used "for flattening quills and painting skins."

I have collected specimens and data on four kinds of porcupine quill flatteners from Wisconsin, Minnesota, North and South Dakota, Montana, and Wyoming. They are attributed to the Menominee, Sioux, Arikara, Blackfeet, and Arapaho Indians. Only one group of these flatteners is made from metal and undoubtedly dates from a period of time when the White man was influencing the Indian craftsmen. The two groups of antler specimens may, by nature of their composition, date prior to the coming of the White man. My own opinion, partly subjective and partly based upon the newness of their appearance, is that these particular specimens were manufactured after European contact. However, this type and style of tool may date back into the prehistoric period. This hypothesis, of course, remains to be proven by archaeological or ethnological methods. The last group of quill flatteners contains six archaeological specimens. Their designation as quill flatteners is reinforced, and validated by their archaeological provenience and very close resemblance to an ethnological specimen.

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Missouri Basin Project
Lincoln, Neb.
August, 1959

EVIDENCE OF A FLUTED POINT TRADITION IN ECUADOR

Robert E. Bell

Abstract

The discovery of fluted points at one site in the Andean Highlands near Quito, Ecuador, suggests that the fluted-point tradition extended into South America. The association of scrapers, knives, and gravers with the fluted points indicates a hunting assemblage which may be related to paleo-Indian horizons of western United States.

THE DISCOVERY of several fluted projectile points along with a variety of scrapers, knives, and pointed gravers at a site located in the highlands of Ecuador suggests that the fluted point technique associated with the paleo-Indian horizons of North America is also represented in South America. A collection of surface materials from one site near Quito, Ecuador, indicates an early hunting complex which is typologically similar to paleo-Indian materials from western United States. The site is on the west bank of the Río Chicha, to the south of Tumbaco, on the road to Hacienda El Inga about 14 or 15 miles from Quito in the Province of Vichincha. It was discovered by A. Allen Graffham and his wife in January, 1956, at which time most of the specimens were collected. Perhaps four or five trips were made to revisit the site during the early months of 1956, but few additional specimens were collected as little or no rain had washed the area. All of the material is now at Ardmore, Oklahoma, in the collection of Graffham, who permitted me to photograph the specimens and reported all available information about the site.

The site is situated on a hilltop on the western edge of the Río Chicha canyon, so that it is several hundred feet from the site down to the river itself. The specimens are apparently weathering out of a dark colored soil deposit which forms a mantle or layer of soil resting on top of the bed rock or consolidated sediments which form

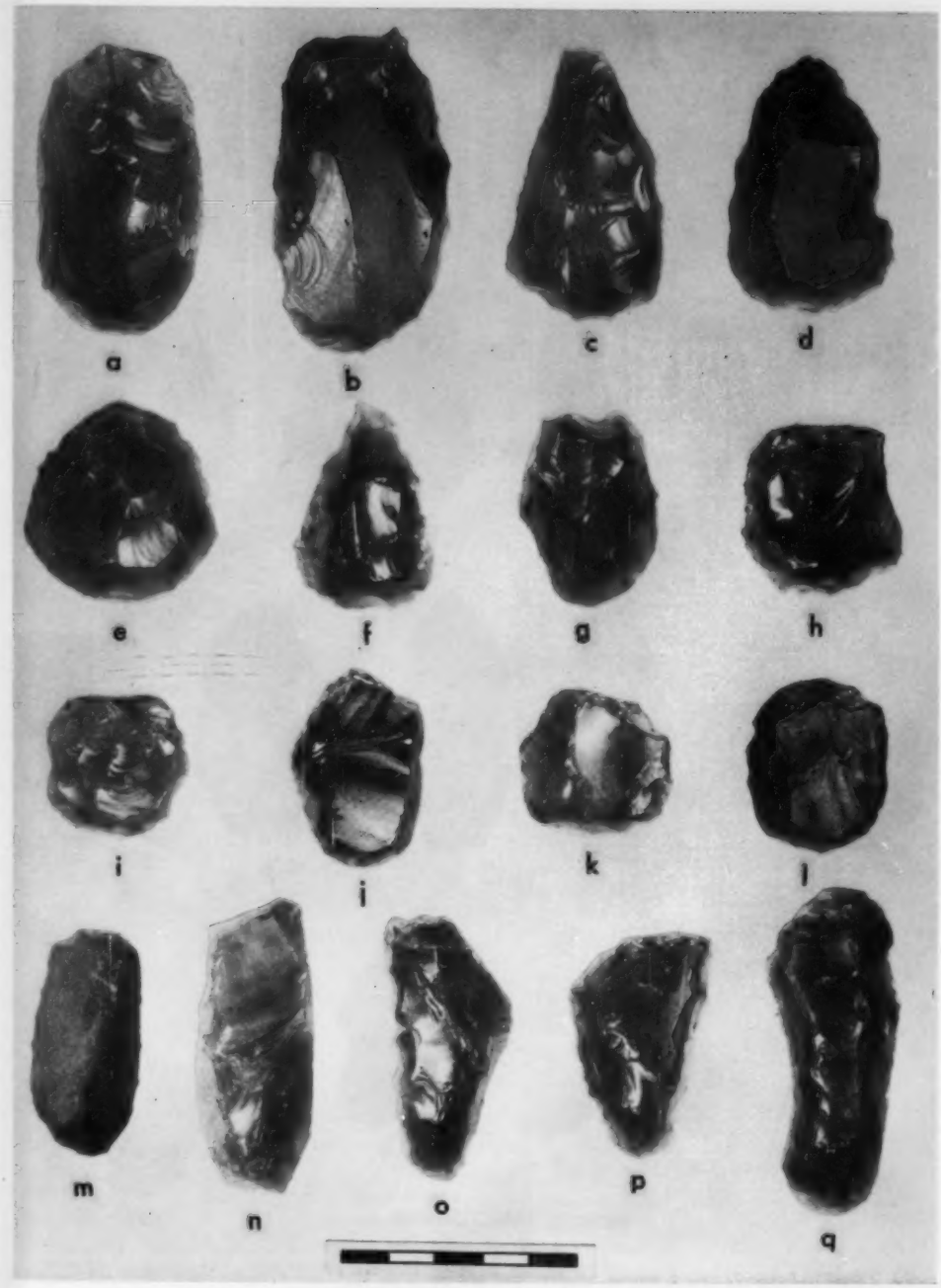

FIG. 1 [Bell]. Scrapers from Highland Ecuador. *a–k*, Flake end scrapers; *l*, *m*, ovoid flint scrapers; *n–q*, flake side scrapers. Scale: 5 cm.

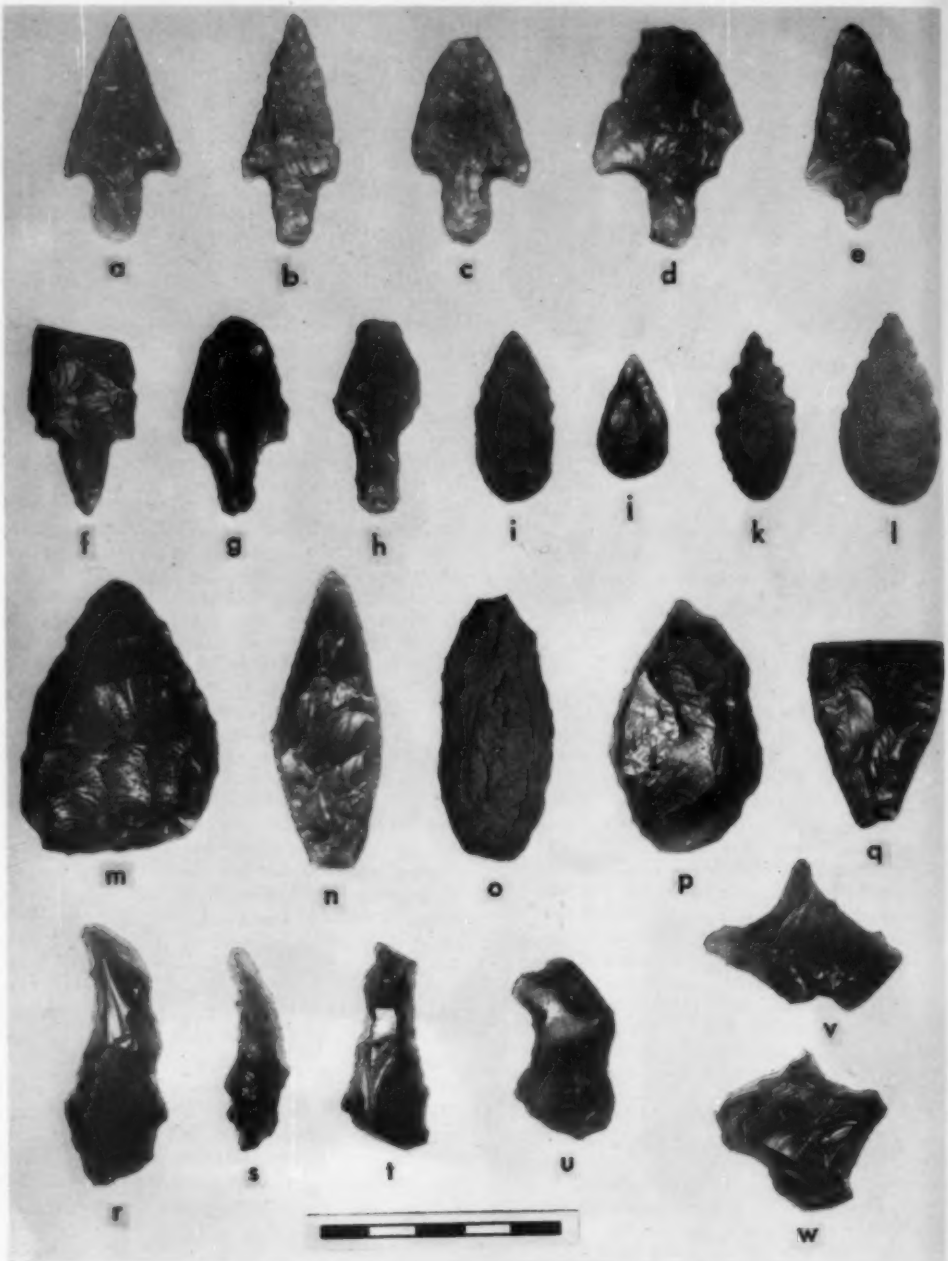

Fig. 2 [Bell]. Projectile points, knives, scrapers, and gravers from Highland Ecuador. *a–h*, stemmed projectile points; *i–l*, oval-shaped projectile points; *i*, *k*, *l* not obsidian; *k*, *l*, notches on blade; *m–q*, knives; *o*, basalt; *r–t*, specialized curved scrapers made from flakes and chipped only on one face; *u*, spoke shave-like scraping tool; *v*, *w*, pointed gravers made from thick flakes. Scale: 5 cm.

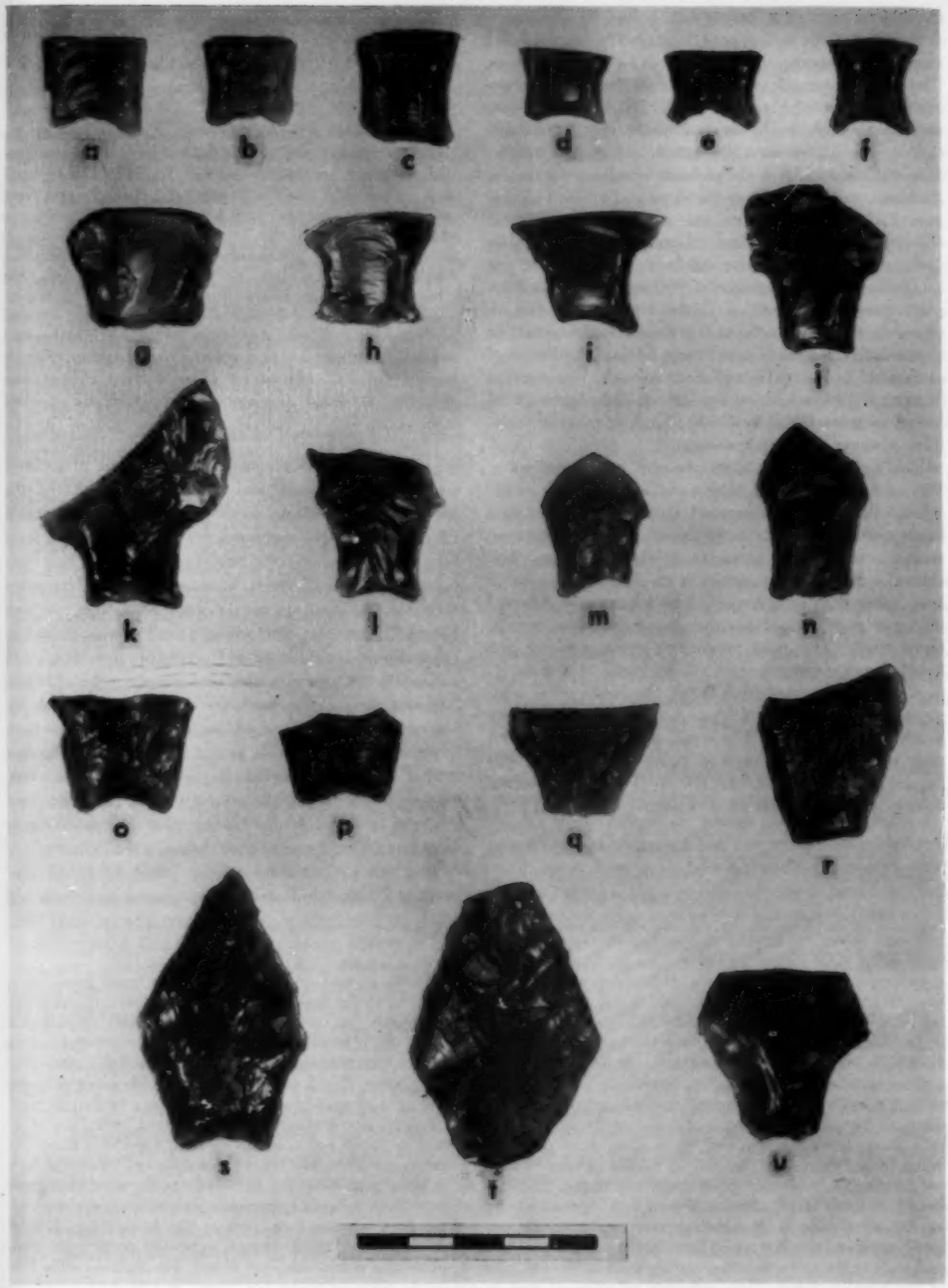

FIG. 3 [Bell]. Projectile points from Highland Ecuador. *a*, base of fluted point, fluted on both faces, slight grind-

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the hill. The area is continually grazed by sheep and cattle so that the soil deposit is gradually being eroded away to expose the underlying consolidated sediments. The artifacts are left resting upon the hard surface underlying the site. According to Graffham, much of the site has already eroded away although the highest section of the hilltop is still covered by the soil mantle. The soil layer varies from perhaps 6 inches to 2 feet in thickness, depending upon the slope and amount of erosion, and extends over an area approximately 50 feet wide by 150 to 200 feet long. Although the artifacts were obviously coming from the soil layer, no digging or test excavations were undertaken. Graffham reports the complete absence of pottery or animal bones at the site, although some darker colored areas may represent hearths or concentrations of occupational debris. The bones of mammoth, horse, camel, and sloth are to be found in the vicinity of Chicha canyon but no established artifact associations were found by Graffham. A number of localities, however, were not investigated.

The best specimens from the site are illustrated in Figures 1–3. Almost all of the artifacts are made of obsidian, although specimens of dark colored flint and basalt are represented. Scrapers are the most common artifact; many of the projectile points are broken. The general assemblage suggests that the site marks a camp area rather than a "kill site." The presence of different projectile point types hints that two occupations may be represented. The most interesting specimens are the fluted points, represented chiefly by bases, broken or reworked examples. Although fluted, the points differ from classic Folsom or Clovis types, suggesting a distinctive South American form. The total assemblage suggests an early paleo-Indian tradition in South America, but will require further study and excavation to properly evaluate its role in South American prehistory.

University of Oklahoma
Norman, Okla.
September, 1959

ABORIGINAL GILDING IN PANAMA

S. K. Lothrop and Paul Bergsøe

Abstract

Lothrop places on record the original study of the "mise en coleur" gilding of Coclé objects which Bergsøe had completed in 1940. The Coclé specimens were made of a copper-gold alloy with low gold content, and were cast in molds. Because such an alloy corrodes easily, the exact composition of the Coclé alloy could not be determined. The Coclé goldsmiths did not use the hammered overlay, mercury gilding, or leaf gilding processes, but rather the "mise en coleur" process in which the copper is removed from the surface of the alloy leaving a blackish-brown, spongy gold deposit as an overlay. This spongy overlay is compressed and returned to a golden color by hammering and burnishing. The surface copper was probably dissolved by ammonium carbonate derived from urine.

IN COPENHAGEN August, 1938, I had the pleasure of meeting Paul Bergsøe who had recently published the results of his studies on the aboriginal gilding of Ecuador (Bergsøe 1938). He expressed interest in metalwork from Sitio Conte, Province of Coclé, Panama, which had been published by the Peabody Museum, Harvard University (Lothrop 1937). As a result, some time later, we sent Bergsøe 27 samples of Coclé gilding, to be examined by the technical methods he had previously developed. On January 9, 1940, Bergsøe sent us the report printed below. I immediately wrote that we would like to publish his observations as well as the detailed analyses of the individual samples. My letter probably reached Copenhagen on the day of the German occupation. After the war, Bergsøe wrote that he had received it and had mailed the analyses. They evidently did not pass the censorship or were lost at sea, for they never reached this country.

Bergsøe's manuscript recently turned up in the files. In spite of the lapse of time, his observations have not

(*continued from preceding page*)

ing along sides and base; *b*, base of fluted point, fluted on both faces, ground on both sides, slight basal grinding; *c*, base of fluted point, fluted on both faces, some secondary chipping along base after removal of flutes, slight grinding on sides and base; *d*, base of fluted point, fluted on one face only, ground along sides and base; *e*, projectile point base, not fluted, appears to have been made from flat flake, slight grinding on sides; *f*, base of fluted point, fluted on one side only, reverse face seems to be flat surface of a flake, secondary chipping across base after flute was removed, slight grinding on sides and base; *g*, base of fluted point, fluted on both faces and showing remnant of striking platform, in removal of flute on reverse, flake hinged off and spoiled specimen, obviously broken in manufacture, no grinding; *h*, base of fluted point, fluted on one side only, not ground; *i*, base of fluted point, fluted on both faces, left tang damaged, ground on sides and base; *j*, base of fluted point, fluted on both faces, but flutes not much longer than stem, ground on sides and base of stem; *k*, projectile point base, two flutes removed from one face, no grinding; *l*, projectile point base, not fluted, grinding along sides and base; *m*, projectile point with attempted fluting on both faces, appears to be a resharpened example made from a broken specimen similar to *j*, slight grinding on sides, right tang slightly broken; *n*, projectile point with flute on one face, reverse flat from original flake, blade apparently resharpened from broken specimen, sides of stem ground, black flint; *o*, projectile point base, thinned with three or four flakes, grinding on sides and base; *p*, projectile point base, not fluted, but thinned with four or five parallel flakes, slight grinding on sides; *q*, base of projectile point or knife, not fluted, not ground; *r*, projectile point base, not fluted, grinding along edges of stem; *s*, projectile point, not fluted, slight grinding on edges of stem; *t*, projectile point or knife, not fluted, not ground, point broken; *u*, base of projectile point, not fluted, slight grinding on right side of stem. Scale: 5 cm.

been superseded by subsequent research. Even without the analyses on which they were based, they give a new insight into aboriginal metallurgy. The Peabody Museum has a record of the catalogue numbers and grave associations of the specimens analyzed. This list is of value now only because it indicated that the metal specimens were representative and reflected the entire ceramic sequence which was later established for stratified Sitio Conte graves. Although changes in type and style of gold jewelry took place during about 1000 years, the gilding techniques apparently remained unchanged.

Report on Coclé Metallurgical Investigations

Paul Bergsøe

My first task was to investigate what technical resemblance, if any, existed between the material from the Coclé finds (Lothrop 1937) and the well-known gold objects from Esmeraldas, Ecuador, which I examined and classified (Bergsøe 1938), a large number of which have subsequently been housed in the National Museum at Copenhagen. Technically speaking, it is practically impossible to find any points of similarity.

All the gold objects from La Tolita and Atacames in Ecuador were hammered; not one single molded object was discovered. The technique consisted in the melting of native gold to form an ingot by means of charcoal and blow-pipe and subsequent hammering into shape. Coclé, on the contrary, shows us molded objects, in which the technique may be said to have attained a very high standard. In other words, the natives must have been acquainted with the use of crucibles and with the construction of molds and cores. As regards Esmeraldas, it is remarkable that all the objects should be so inconceivably small and thin; they are almost certainly the finest and smallest gold objects ever found in America, and it appears as though gold could only be procured in small quantities. To make up for this, however, the Esmeraldas natives would seem to have been endowed with great dexterity and skill, and their use of platinum for plating gold bears witness to a very highly developed technique in this respect. The Coclé natives do not appear to have been acquainted with platinum plating, if we may judge by the fact that no platinum-plated objects have been discovered among them.

Both peoples were acquainted with gilding, but the characteristic gilding method employed in Ecuador — I have called it "fusion gilding" — was not demonstrable on any single one of the many gilded objects from Coclé that I have examined. The method was undoubtedly unknown there. The gilded copper objects found in Coclé show precisely the same high degree of corrosion as the corresponding objects from Ecuador. Corrosion is due to the same cause: a gold content in the copper core. This creates a local difference in potential between the copper and gold, which becomes disintegrated in small particles. In the presence of moisture, the copper will oxidize, and in the presence of carbonic acid the usual products of oxidation will be formed which, however, are black on account of the separated gold. The process has been described (Bergsøe 1938: 10).

Gold is, as we know, a metal completely exempt from corrosion, even when the copper content is relatively high. Copper itself is also astonishingly resistent to corrosion, especially in the pure state; a number of the copper articles found in Ecuador, which are made from practically speaking pure native copper, were not even green. But in the case of alloys of gold and copper with a high copper but low gold content (0.5 to 20%) the case becomes quite different, these alloys being extremely subject to corrosion. The heavy corrosion of these alloys makes it impossible for us to determine by means of chemical or spectroscopical tests the original composition of the corroded material, especially the quantitative relations of gold and copper, for it must be regarded as a certainty that some part of the copper has been dissolved and washed away by the action of water containing carbonic acid. The gold content will thus always be too high.

In Esmeraldas, Ecuador, gilding was performed by overlaying the copper with a melted copper alloy (about 20% copper) which fuses at a temperature 200°C lower than the melting point of copper. After cooling, this overlay was smoothed out by hammering, but it was impossible to avoid the formation of tiny rifts where corrosion could set in and continue its action, because the gold was in constant intimate connection with the copper which, in addition, itself had received a slight gold content, the gold having penetrated into the core during the process of gilding. The final result was that the gilding became loosened from its base; large quantities of these gold scales have been found.

Gilding in Coclé was not carried out in the above manner. The gold overlay does not contain as much copper as it should if "fusion gilding" had been employed. Neither was gilding accomplished by means of mercury. I have expressed my doubts as regards both mercury-gilding and mercury-soldering in America (Bergsøe 1938: 51), in spite of the fact that the theory has found many adherents. I now consider myself in a position to prove that none of the objects sent to me were mercury-gilded.

Samples of the gilding were taken from every object. The test pieces were cleaned, boiled in dilute nitric acid, and then used as electrodes for the spark for a spectroscopical analysis. In no single case was it possible to demonstrate the presence of remnants of the mercury which otherwise must have been present. Even the presence of such an infinitesimal quantity as 1 to 1,000,000 parts would have been identified.

Counter tests were made in the following way. A copper strip was mercury-gilded and then heated until not only had the mercury evaporated, but even the gold had diffused into the copper. Nevertheless, a spectroscopical examination of the copper revealed an amount of mercury present corresponding roughly to 1000 times more than the demonstrable minimum.

Residues of mercury cannot disappear in the course of years. From the National Museum in Copenhagen I received two pieces of gilded copper, the one dating undoubtedly from A.D. 1138, the other dating about A.D. 1200. The first was leaf-gilded, and after the removal of the overlay, it was seen that the copper had been completely protected from corrosion. The other piece was assumed to have been mercury-gilded, for the gold was inseparable from the core; neither were there any signs of corrosion in this case. It was spectroscoped and showed such evident traces of mercury as to leave no doubt that mercury residues cannot "evaporate" from the gold, even after the lapse of thousands of years. Consequently I consider that the objects from Coclé were not mercury-gilded, and I am still of the opinion that, if mercury-gilding or silvering has been employed anywhere in America, mercury must be demonstrable in the overlay to an extent of 0.01%.

How, then, was the gilding of the Coclé material carried out? There seems to be no doubt that some of the objects were leaf-gilded, as the investigations previously carried out in America also showed. It might be appropriate to point out that this manner of leaf-gilding must not be compared with modern leaf-gilding, where gold-leaf, which the finest technique enables us to hammer out into inconceivably thin sheets, is caused to adhere by means of some adhesive. In those days it was quite impossible to hammer out gold sheets of such extreme thinness.

There are also found in the Old World specimens of gold-leaf gilding where the gold-leaf was applied by means of heat to the carefully cleansed copper core. Gilding of this kind may serve as an excellent protection to the underlying copper if it adheres firmly and closely enough to prevent the ingress of atmosphere and moisture between the leaf and the underlying surface. This, however, does not clear up the problem of how the Coclé objects were gilded. In the case of many of them it is obvious that leaf-gilding has not or simply could not have been the method employed.

"Mise en coleur" is not gilding in the true sense of the word, but is rather a coloration produced by removing the copper from the surface. The gold overlay which thus appears is derived from the gold content of the object itself. It appears probable to me that the quite thin gold overlay found on several of the Coclé objects was derived from treatment of this kind.

I carried out certain experiments which showed me that it was possible to "collect" the gold to form an overlay even in cases where the copper did not contain more than a small percentage of gold. This cannot be accomplished by oxidizing the copper by means of heat and then dissolving the copper oxide in an acid. If the attempt is made, the result is negative, for, even supposing that one can procure a gold overlay from a copper-gold alloy so poor in gold, the overlay will not adhere firmly. If, on the other hand, copper with a gold content of 5 to 20% be laid in a solution of ammonium carbonate and allowed to stand for a few days where air can reach it, the copper will be dissolved superficially and the gold will appear as a blackish brown, spongy overlay, which adheres fairly firmly to the copper. This gold sponge can be compressed by careful hammering and burnishing. In this way it is possible to produce a thin gold overlay on copper containing but a very small percentage of gold. It is quite thinkable that such a method was used, in which case urine was employed as a source of ammonium carbonate.

All primitive people used urine, especially for cleansing purposes. It is this very content of acid ammonium carbonate which determines its use. The use of urine in the treatment of gold has been suggested again and again in olden times, probably owing to the color. The most recent "recipe" known to me containing urine dates from 1804. Whether or not the gilding upon the Coclé objects was produced in this way it is, of course, impossible to prove. Nothing definite can be said regarding material so heavily attacked by corrosion, and the answer to the problem will probably never be given. But this method of gilding is perfectly conceivable. Possibility assumes the aspect of probability when we consider that the underlying metal really consists of a gold-copper alloy made up of a great deal of copper and very little gold, and that the gold overlay is as thin as it really is.

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EXPERIMENTS IN THE USE OF ATLATL WEIGHTS

Orville H. Peets

Abstract

Evidence is supplied that the weights often attached to atlatls do not add to the force of the dart. An experiment was made with a copy of the atlatl with stone weight from Baylor Rock Shelter and cast with and without the weight showed no significant difference. It is proposed that the purpose of the weights was to secure balance on the hand of the atlatl-dart combination. The superiority of the harpoon over the arrow in carrying a line is given as explanation of overlapping of relics of bow and atlatl along water courses.

THE ASSUMPTION is commonly made that the stone weight on the atlatl adds force to the cast of the dart. No actual experiments have been published that prove this to be true. The experiment described here seems to prove that it is not true and that the search for the real

purpose should continue, for we cannot go on expanding an already large category on the grounds that some, at least, of these objects cannot have had any other use.

Malcolm Hill, whose work with the atlatl is mentioned by Kellar (1956), was a painstaking amateur very willing to talk of his experiments and to associate archaeologists and others with them, but in reply to my inquiry concerning the function of the weight he said merely that he thought "only a very light atlatl would require one." Jim Browne (1940) reports his experiments with the atlatl in a well illustrated article. He does not treat the question of weights, but his main purpose seems to be to warn archaeologists against dividing projectile points into arrow and spearheads according to size only. In this he has the support of all archers who have investigated this subject: the arrows used with the first bows could have been — and very probably were — atlatl darts unaltered except for the nocks, so the dividing line is often placed at the point where it would have been least visible.

Lack of accuracy, even after long practice with the atlatl, may help explain the reluctance of experimenters to report their work. Browne, who mentions six months of intensive practice with the atlatl and spear, decided that "any close accuracy is impossible." One may make reservations as to the degree of accuracy ultimately attainable, but the present lack of it may cause a serious error in some of our measurements.

In making casts with and without a stone weight on the atlatl for the purpose of testing the influence of the weight, I used a rather heavy dart to reduce the distance to be measured, and an elevation from the horizontal of about 40° was selected as apt to give the limit of distance, but the matter of accuracy entered here, for it is unlikely that the elevation of any one of the throws was exactly the one selected. However, the pattern was very good for depth, which was important, though not good for width, which could be neglected. The average distances were: 62 yards and about 1 inch for the atlatl without its stone weight, and 62 yards and about 10 inches with the weight attached. This difference has no significance, and the conclusion that the weight on the atlatl does not directly influence the force of the dart is in accord with many less formal tests I have made. If any other experimenter has had results which are at variance with these, they should be published, or better yet, more tests made to locate the cause of the differences.

The atlatl and stone weight used in this experiment (Fig. 1 *a*) were replicas of those illustrated with accurate measurements by Fenenga and Wheat (1940). No finger loops were attached because the distance of 26 mm. from the proximal end suggested for them in the text would have been an impossible location. The two slight notches shown there are where the little finger would encircle the shaft while the thumb and index held the dart — a common arrangement. A bowyer would object also to the explanation that grooves shown below the weight were to mend some cracks in the shaft. A simple binding of sinew would have done this, but grooves would have weakened a place that, by the cracks, is shown to have "worked" too much. Other explanations are more probable.

Many atlatls, ancient and modern, never had weights. This is the case of the atlatl shown in Figure 1 *c*. It was bought by a dealer in Yucatán with an assortment of native bows and arrows. Neither the buyer nor seller knew

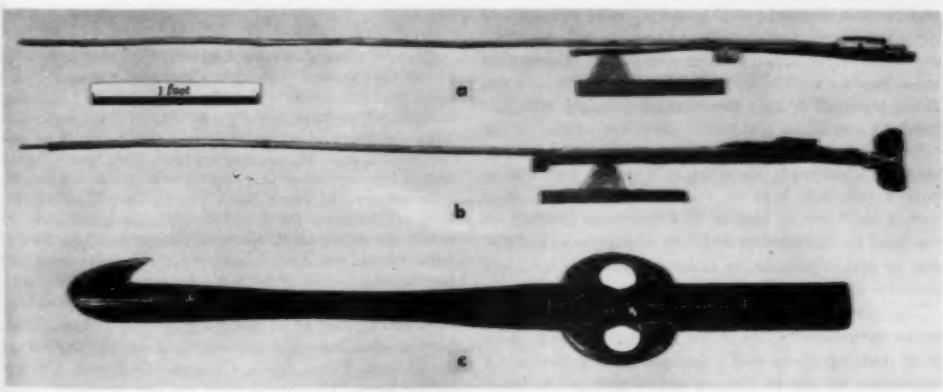

FIG. 1 [Peets]. Atlatls illustrating balancing function of atlatl weights. *a*, scale replica of the atlatl from the Baylor Rock Shelter, Texas. It is excellent to use with or without the stone weight. The dart shown is slightly too long to be in balance at the base of the fingers, but making it about 3 inches shorter, or moving the weight up about 1 inch, would make the balance perfect, though any point along the hand is comfortable. *b*, heavy dart with 7-by-¼-inch steel rod in the head in balance with walnut atlatl and light slate "bannerstone" copied from one found with hole only partly drilled through. It has not been damaged, nor has the weight become loose after more than 100 throws. *c*, atlatl from Yucatán; age uncertain, probably less than 100 years; however, plainly made for use. A heavier dart is in balance on the hand with this atlatl, which never had a weight, than is in balance with the Baylor atlatl, because of the heavy wood of the Yucatecan example. *a*, *b*, to scale; *c*, 20½ inches long.

what it was. It is made of such heavy wood that with an average dart (or one supposed to be average) the combination is in balance on the hand, and this condition, because of the materials commonly used, may be more normal than that of imbalance requiring correction by weights.

To see why this may be true, suppose a bamboo dart 5 feet long with a medium stone point and imagine it marked in three equal sections. The proximal section would be lightest; the middle section only slightly heavier and the distal section with fore-shaft and stone point perhaps 25% heavier. If the atlatl, made of hard wood, were about 20 inches long back of the hand, its extra weight would normally balance the extra downward pull of the two forward sections of the dart, giving the equation: atlatl plus proximal section equal middle plus distal section in downward pull, thus giving balance on the hand, a universally recognized desideratum of spear throwing. Harpoons and heavier darts would require weights, but their need would be recognized in advance. Two conditions limit the correction possible in increasing the length of the atlatl to get balance: one, the increased leverage against the hand, and the other, the greater wig-wag from higher arc of the swing, and this is all the more serious because the feathers have far less power to stabilize the flight of a heavy shaft than a light one.

A hand-thrown spear and an atlatl-and-dart have in common the fact that corrections of aim are most easily made from the point of balance, but there is also the matter of comfort in holding these weapons poised for long in a horizontal position. (The very short "Santa Barbara" atlatl seems well suited only for casting downward.)

This paper proposes that balance on the hand is the real purpose of atlatl weights, and no valid judgment of the importance of the quality is possible unless certain contingencies of actual use are simulated. Hunting big game beside a trail or water hole or using a harpoon below a waterfall or in a canoe while paddling with one hand are conditions and surroundings not normal to the college campus where experiments with the atlatl are generally conducted. However, it is usually sufficient to have a volunteer hold an atlatl and dart combination that is badly out of balance in a horizontal position on the hand for ten minutes and then change to a combination in perfect balance, to make this point without any primeval setting.

Harpoons are mentioned because they are often neglected in studies of the atlatl. Kellar, however, gives them due importance and points out that the bow is not convenient for use in a canoe and is damaged by moisture. It is also true that the arrow is unsuited to carrying a line such as were even the best of the Indian ones. The modern bow-fisher uses a very thin waterproof line on an efficient reel, but some experiments I made several years ago with Indian-type equipment were spectacular failures, though at the time I had had the Delaware championship in archery and the distance record. The arrow, though heavy and having a steel broadhead, could not handle the wet sandy line. The first jump of the arrow was far too rapid, and the inertia of the line seemed to be increased by it. And when there was enough line in the air to have the wind catch it, all accuracy was lost. So the finding of relics of the atlatl along water courses in contexts much later than the introduction of the bow is easily explained.

The early big game hunters and fishers must have used heavy darts and harpoons. And heavy weights would have been needed to balance them, but the weights exist by the thousands, and not one would require a spear that could be called unreasonably heavy for the work required of it.

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Indian River Hundred
Millsboro, Delaware
December, 1959

EARLY MAN SITES NEAR MOAB, UTAH

Alice P. Hunt and Dallas Tanner

Abstract

Many surface sites represent three different early complexes that generally occur in this area at separate locations and are not mixed with each other. The earliest occupation, perhaps late Pleistocene, is characterized by Folsom points and a type of Pinto Basin point. A second occupation, probably younger and occurring in a different area, is represented by Gypsum Cave points and a second, different type of Pinto Basin point. The third occupation, representing the Uncompaghre complex, and evidently the youngest of the three occupations, can be correlated with the Recent but prepottery alluvium of the region.

A LARGE number of surface sites near Moab, Utah, have yielded projectile points and associated artifacts of the Folsom, Pinto Basin, Gypsum Cave, and Uncompaghre types. The occurrences are very similar to those near Concho, Arizona, as described by Wendorf and Thomas (1951). Three different complexes are represented at the Moab sites. One complex was recently discovered by Mr. and Mrs. Dallas Tanner of Moab, who plan to present their collection, now catalogued, to the University of Utah. It is characterized by Folsom projectile points and the type of Pinto Basin projectile point illustrated in Figure 2 *a*. Artifacts of the complex have

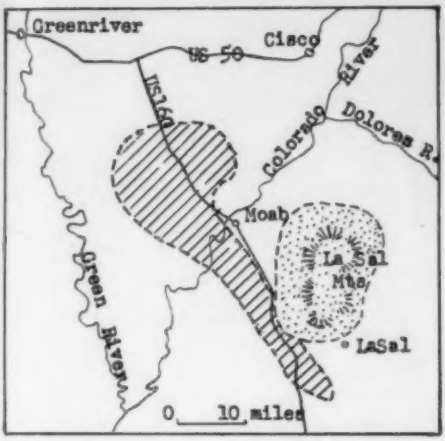

FIG. 1 [Hunt and Tanner]. Sketch map showing localities where the Moab complex (ruled area) is represented, and location of sites representing the La Sal complex (stippled area) near Moab, Utah. Sites of the Uncompahgre complex are distributed through both these areas.

been found widely scattered on the plateau some distance away from the La Sal Mountains, and at four locations they have been found sufficiently concentrated to constitute sites and define a complex (Fig. 3) which we call the Moab complex. A second complex, characterized by Gypsum Cave projectile points and the types of Pinto points illustrated in Figure 2 *e, f*, is represented at more than 30 sites on the La Sal Mountains and around their base. We refer to this as the La Sal complex. The third complex, represented by more than 100 sites, is the Uncompahgre, characterized by large corner-notched projectile points and abundant grinding stones. With but few exceptions, the three complexes in this area occur separately and are not mixed with each other (Fig. 1).

MOAB COMPLEX

Folsom and Pinto artifacts of the Moab complex northwest of Moab are widely scattered on the divide between the Green and Colorado rivers, at an altitude of 4800 feet. This divide consists of extensive bare benches of Jurassic sandstone mantled with dune sand of two ages, the older of which represents slightly compacted stabilized dunes, stained reddish. The occupation layer underlies this older sand. The sandstone under the dunes is pitted with shallow depressions a few inches to a foot or two deep over areas ranging from a few hundred square feet to a quarter of an acre. After rains these fill with water and form natural storage tanks. The nearest flowing spring is 5 miles away, but in the occupation area water could be obtained by digging into buried depressions under the dunes. In a more pluvial period there may even have been small seeps.

Vegetation in these areas is mostly blackbrush (*Coleogyne ramosissima*). With it is associated considerable scrub oak, prickly pear, some grasses (principally the curly grass, *Hilaria jamesii*). Along the washes and at sheltered places along the ledges are junipers and mountain ash. In a more pluvial and cooler period there may also have been some pinyon pine.

The benches are strewn with chert pebbles and cobbles derived from the Jurassic formations. The cherts occur as rounded concretions several inches in diameter, as plates or slabs, and as pieces of petrified wood. These cherts, deposited as a lag gravel on the sandstone benches before the old sand dunes were deposited, have been extensively flaked for making the stone tools found in the area. The chert nodules, flakes, and artifacts, concentrated in the depressions as a lag gravel, form a pebble pavement in which the stones touch one another.

Difficulties in nomenclature are encountered in dealing with Pinto Basin type projectile points, because a number of different types have been described at the Pinto Basin site, and elsewhere a still larger number of varieties of points have been referred to as Pinto Basin types. For purposes of this paper we distinguish the six types of Pinto Basin projectile points illustrated in Figure 2. By Moab complex we refer to the collection of artifacts found together at one site (Fig. 3), though the possibility is recognized that the complex could represent more than one occupation. The collection includes a Folsom projectile point, five Pinto A projectile points, two large projectile points with sloping shoulders and straight stems, one stemmed knife, 12 small snub nose scrapers, four oval side scrapers, one pick, and one perforator. These tools were found together with the lag gravel in a shallow depression. The large number of well-made tools in the single depression and their scarcity in neighboring ones indicate that the occupied site was nearby, perhaps in sand that has been washed from the bench. Three other sites in the area shown by ruling in Figure 1 have yielded less complete collections assigned to the Moab complex, in addition to the other widely scattered artifacts. Four other Folsom points in unrecorded context also have been found by collectors, one in the north part of the area, two in the south, and the fourth near the confluence of the Green and Colorado rivers.

ARTIFACTS FROM MOAB COMPLEX SITES

Folsom points. Two specimens (Figs. 3 *n*, 4 *a, b*). A patina 1 mm. thick has formed on the point in Figure 4 *a*. Specimen in Figure 4 *b* is identical to Lindenmeier Folsom points of the short broad style and exhibits the same skilled workmanship, fine secondary retouch along the edges, and even the hump in the center of the

FIG. 2 [Hunt and Tanner]. Outlines of six types of projectile points referred to as Pinto points. *a*, Pinto A; *b*, Pinto B; *c*, Pinto C; *d*, Pinto D; *e*, Pinto E; *f*, Pinto F.

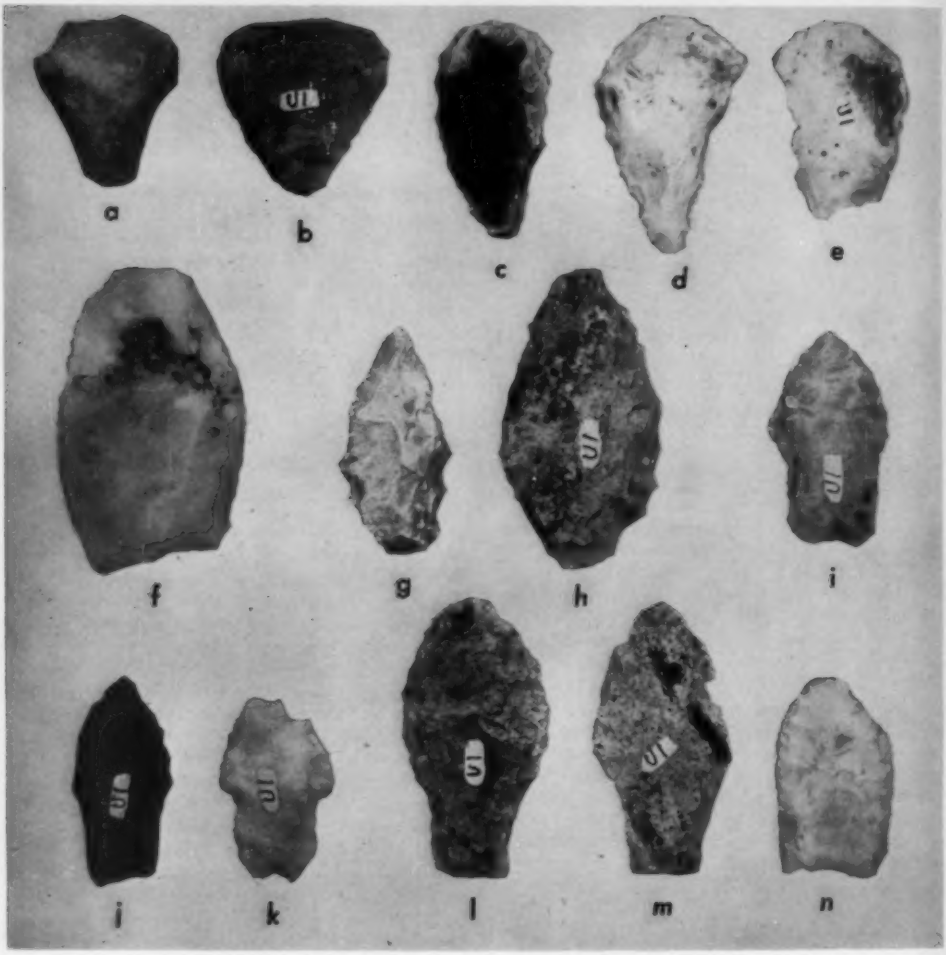

Fig. 3 [Hunt and Tanner]. Artifacts of the Moab complex found together in a depression on a sandstone bench. *a–e*, snubnose scrapers (those with numbers show under side); *f*, oval scraper; *g*, pick; *h*, knife; *i–k*, Pinto A projectile points; *l*, *m*, large points with sloping shoulders and straight bases; *n*, Folsom point.

base believed to have served as a seat for removing the channel flake (Roberts 1935, Figs. 2, 3 *a*, Pls. 7, 8). The point in Figure 4 *a* has the following dimensions: 3.7 cm. long, 1.7 cm. wide at base, 2.2 cm. wide at neck, 1.7 by 1.1 cm. spall on face shown, 2.2 by 1.1 cm. spall on other face. Dimensions of the point in Figure 4 *b* are: 4.2 cm. long, 2.2 cm. wide at base, 2.5 cm. wide at neck, 3.7 by 1.0 cm. expanding to 1.6 cm. spall on both faces.

Pinto A points. Sixteen specimens (Figs. 3 *i–k*, 4 *j–n*). Compare Amsden 1935, Pl. 13 *k*. Except for the notching of the base, this type approaches the very elongate stem of the Lake Mohave point (Amsden 1937, Pl. 41). In several specimens a spall has been removed from one face and the blade is asymmetrical; in another, collected too late to be photographed, a spall has been removed from both faces of the stem for about two-thirds of the length of the stem. Dimensions are uniform: length 4.0 to 5.0 cm., width 1.8 to 2.3 cm., thickness 7 to 8 mm. Similar points at sites near Concho, Arizona, are believed to be earlier than the Concho complex (Wendorf and Thomas 1951, Figs. 47 *a*, 48 *b–f*). This is the most common point at early lithic sites near Aneth, Utah (Mohr and Sample 1959, Fig. 2), and one was seen in a collection of Pinto points in the Denver Museum of Natural History from Montezuma Canyon, Utah (Botelho 1954: 185–6). It was present in Levels II and III at Danger Cave, Utah (Jennings 1957, W11).

Third type of point in complex. Four specimens (Figs. 3 *l*, *m*, 4 *o–q*). This point has a narrow stem and a straight base. Average dimensions are 5.0 cm. long, 2.8 cm. wide, with stem 1.6 cm. long. Identical points (or knives) were at sites near Concho, Arizona (Wendorf and Thomas 1951, Fig. 49 *k–m*), and were in Levels II and III at Danger Cave, Utah (Jennings 1957, W12). One atypical specimen (Fig. 4 *o*), a long narrow pointed variety, also is atypical on the Concho sites (Wendorf and Thomas 1951, Fig. 48 *f*). This point also is similar in outline to points of the Clear Fork complex found with Folsom points.

Small snubnose end and side scrapers. Sixteen specimens like those in Figure 3. Outline: elongate with one convex, one straight edge. Ends of all specimens steeply chipped; steep chipping extends around all edges of five specimens. On remaining specimens, steep chipping extends around end and one side, the opposite side having

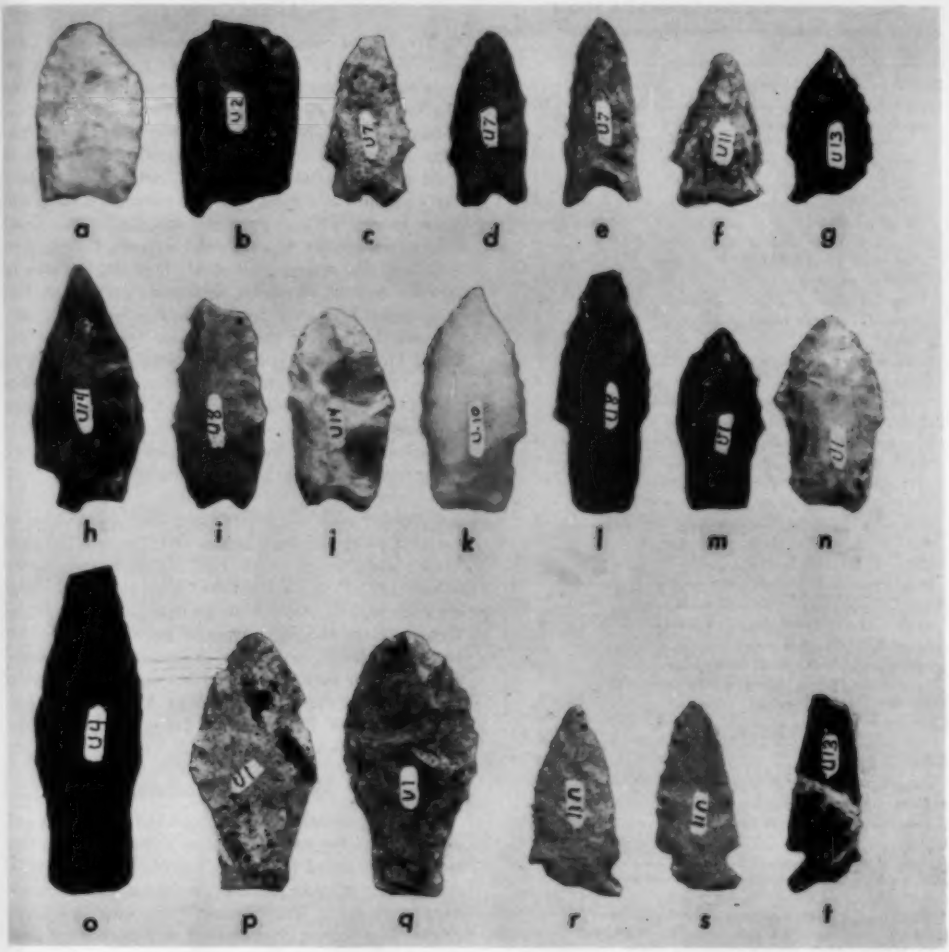

FIG. 4. [Hunt and Tanner]. Projectile points from the general area of Moab complex sites. *a*, *b*, Folsom points; *j–n*, Pinto A points; *o–q*, large points with sloping shoulders and straight bases; *a–q*, part of the Moab complex; *c–i*, *r–t*, points found nearby cannot, at this time, be identified with the complex.

a sharp knife edge. Flake has been removed from top surface of ten specimens; remaining two have low domed tops. Average dimensions are 4.0 cm. long, 2.7 cm. wide, and 7 mm. thick. Ten are patinated. Similar to scrapers from Lindenmeier site (Roberts 1935, Pls. 9, 10).

Side scrapers. Four, like that in Figure 3 *f*. Outline: oval. One sharp angle cutting edge. Flaking on edge of illustrated specimen is same fine regular pressure flaking as on edges of Folsom point (Fig. 4 *b*). Illustrated specimen is 6.5 cm. long, 3.5 cm. wide, and 5 mm. thick, with 0.5 mm. patina.

In the general area of the Moab complex, over 400 stone artifacts were collected by the Tanners (Table 1). The tools of the complex are duplicated many times, and additional tools are represented, some of which probably are part of the Moab complex but the association is uncertain. Most of the unallocated projectile points are Pinto B, C, and D types. Jennings (1957) and Wormington (1957) have observed that many divergent styles of projectile points are lumped together into the category Pinto Basin, and Wormington predicts that "if a sufficient number of specimens could be studied, typological variations reflecting temporal and regional differences . . . probably would become apparent." No Gypsum Cave points, but four Uncompaghre points were found. The only trace of later peoples in the area is a few sherds of pottery in a nearby shelter and a fragmentary typical Basketmaker III–Pueblo I arrowpoint. Apparently these sites were used almost exclusively by early lithic peoples.

Table 1. Artifacts from Sites Northwest of Moab, Utah

	No. of specimens
Projectile points (see above)	43
Scrapers	177
Steeply chipped working edge	
Elongate with flat or low keeled top (snubnose)	57
Round with domed top (2 large, 1.5 pound)	9
Small tabular	2
Turtleback	1
Scraper edges	Common
Sharp, acute angle working edge	
Oval side scrapers and blanks	24
Sinuous edge	16
Saw edge	5
Pointed, 1 dentate edge	3
Straight edge	1
Flake, straight and convex edges	54
Spokeshaves	5
Scraper edge with elongate concave handle	4
Knives and blanks	146
Long, narrow with round or pointed ends	14
Big round or oval	6
Thin oval knives or blanks, rounded ends	25
Thick oval knives, rounded ends, one may be pointed	22
Triangular knives, small with straight base	6
Knife bases, straight edged	30
Knife tips from big blades	37
Midsections from rectangular knives	6
Drills	8
Thick points on heavy base, 2 on spokeshaves	4
Round body fragment	2
Perforators with thin, finely serrate edges, straight or slightly expanding base	2
Picks, small, pointed	9
Choppers or blanks	49
Oval	16
Disc	24
Core (many more not collected)	9
Rubbing stones	2
Hammerstones (many more not collected)	3
Manos	7
Metates, slight basin, uniface	8

Pinto B point. Three specimens (Fig. 4 *c–e*) resemble points from Level III at Danger Cave (Jennings 1957, W10), and points from lithic levels at Hells Midden, Colorado (Lister 1951, Fig. 10).

Pinto C point. Four specimens (Fig. 4 *f, g*). These specimens can be duplicated in the Pinto Basin collection (Amsden 1935, Pl. 13 *f, g, j, l*).

Pinto D point. Five specimens (Fig. 4 *r–t*). The blade of the point in Figure 4 *s* contracts and swells like blades of many California desert projectile points. Similar points are found at Pinto and Amargosa sites on the California deserts (Rogers 1939, Pls. 13 *l, s*, 20 *i*).

Leaf shaped points. Elongate, with a constricted-concave base. Length ranges widely from 4.8 to 7.0 cm. (projected).

Five other projectile points found near Moab complex sites include: a fragment of a large base and side notched point suggestive of smaller ones from the Taylor site, Colorado, in the 11th of 12 levels (Wormington and Lister 1956: 53), in lithic levels at Hells Midden, Colorado (Lister 1951, Fig. 11), and in the La Sal Mountins (A. P. Hunt 1953, Fig. 28 *f*); three projectile points with expanding stems and U-shaped side notches similar to some from Basketmaker II sites near Durango Colorado (Morris and Burgh 1954, Fig. 81, 4 *a–q*); a fragment of a small point with long tangs typical of Fremont and Basketmaker III–Pueblo I sites in this region (A. P. Hunt 1953, Fig. 11). Artifacts associated with these projectile points are listed in Table 1.

La Sal Complex

The La Sal complex, characterized by Gypsum Cave and Pinto E and F types of projectile points (Fig. 5), occurs mostly in the pinyon-juniper woodland zone around the foot of the La Sal Mountains but extends into the mountains to an altitude of 10,000 feet (Fig. 1). At these sites water is plentiful and the vegetation is favorable to food gathering as well as hunting. Artifacts found with the Gypsum Cave points include; stemmed and rectangular knives, wide angle knife tips; drills with small flanges; gravers; flat snubnose end-scrapers; keeled, elongate, flat side scrapers; elliptical choppers; flat slab or boulder metates; ellipsoidal, asymmetrically convex, subrectangular, and oval manos (A. P. Hunt 1953: 28). Around the foot of the mountains, the Tanners also found Pinto E and F projectile points shown in Figure 5 *h–n* and the apparently typologically related points shown in the bottom row of Figure 5, with the Gypsum Cave type points.

Higher in the mountains these Pinto points do not occur with the Gypsum Cave points (A. P. Hunt 1953: 50). However, points similar to these Pinto points do occur together with Gypsum Cave points in the Concho complex (Wendorf and Thomas 1951, Fig. 49), at Aneth (Mohr and Sample 1959, Fig. 2), at Ventana Cave (Haury 1950, Pl. 22) and on the California deserts (Rogers 1939: 56, 57). Accordingly we have included both the Gypsum Cave and Pinto types of points in the La Sal complex, although in this area, as suggested by the mountain sites, they may not be directly associated. The relation, if any, of the locally occurring Angostura-like projectile points (A. P. Hunt 1953: 24) to the La Sal complex is not known.

Uncompahgre Complex

Most of the campsites at altitudes above 6000 feet and many in the canyons were used by a prepottery, pre-Fremont people called Fremont (?) by A. P. Hunt (1953), and given the more appropriate name Uncompahgre complex by Marie Wormington (Wormington and Lister 1956). This occupation correlates with the Recent alluvium known as the Tsegi alluvium on the Colorado Plateau (A. P. Hunt 1953: 21) and Piney Creek alluvium on the high plains (C. B. Hunt in Wormington and Lister 1956: 68). Sites in and around the La Sal Mountains having an Uncompahgre complex are characterized by abundant flat or slightly basin-shaped metates, one-hand manos, large and medium sized corner notched projectile points with expanding stems, knives of several kinds, and drills. Large scraper planes are absent; scrapers with steeply chipped working edges are scarce (A. P. Hunt 1953: 8, 9, Figs. 12, 13, 14).

Similar corner notched projectile points were found at high mountain sites in the Sangre de Cristo Range, New Mexico, but these sites lack grinding stones (Wendorf and Miller 1959). Projectile points like Pinto E and F also were found on some of the sites in the ratio of ten corner notched to one Pinto type. Using radiocarbon dates and geochronology from other somewhat similar

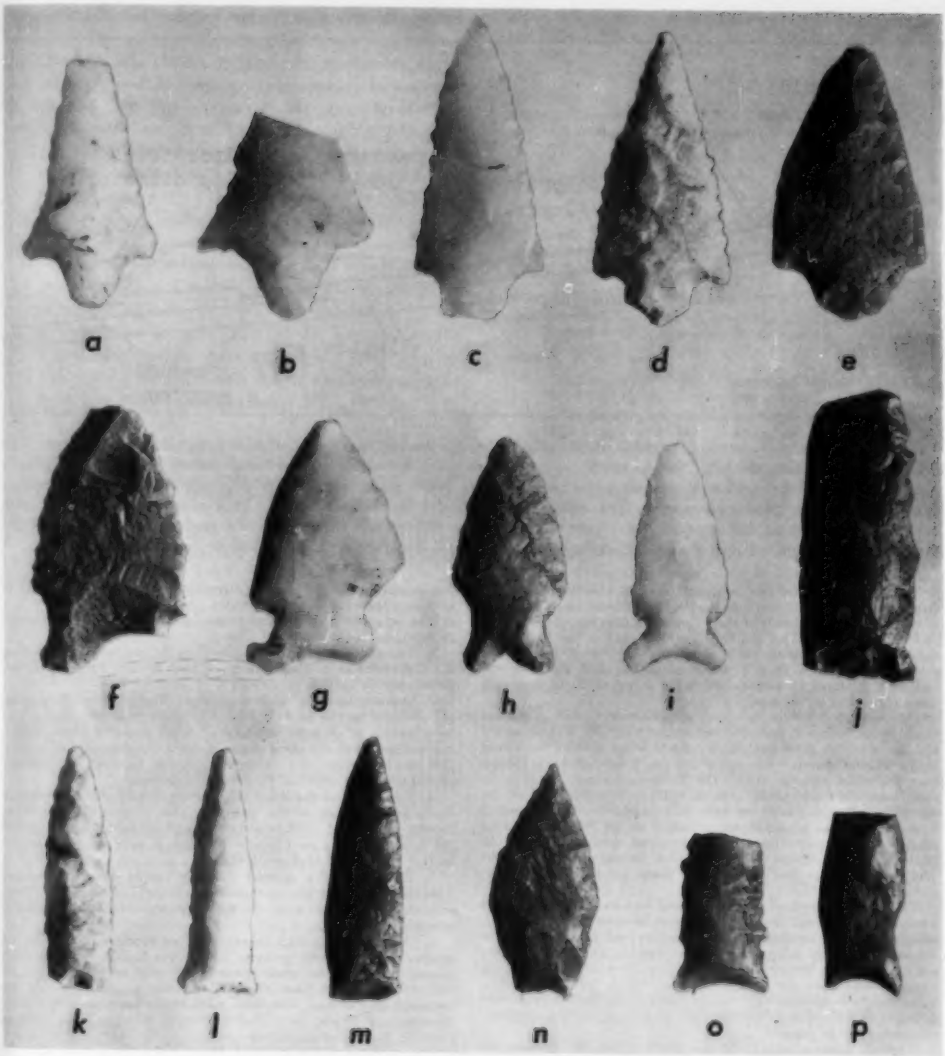

FIG. 5 [Hunt and Tanner]. Projectile points characteristic of the La Sal complex.

sites, an estimated date of 1000 B.C. to A.D. 500 was given the occupation. The presence of Pinto E and F types of projectile points was interpreted as indicating that the mountain sites were occupied nearer the earlier date.

GEOLOGICAL EVIDENCE OF AGE

A geological interpretation of the age of these occupations has been provided by Charles B. Hunt, U.S. Geological Survey, who writes as follows:

> The Uncompahgre and related prepottery occupations can be correlated with a Recent alluvium (Tsegi alluvium on the Colorado Plateau) at many places (Hack 1942; Albritton and Bryan 1939; Kelly, Campbell, and Lehmer 1940; Bryan 1939; C. B. Hunt 1953; A. P. Hunt 1953; Wormington and Lister 1956). At the present time the sites with the La Sal complex (Fig. 5) which are found in and around the foot of the La Sal Mountains cannot be dated geologically. Sites with the Moab complex (Fig. 3) can be related to certain geological deposits that should establish dates for that occupation when and if paleontological remains are found in those deposits.
>
> The Moab complex sites underlie stabilized sand dunes which are the source of the modern but smaller dunes in those areas (Fig. 6). The weathering and compaction of this stabilized sand resembles that of early Recent dunes in the Southwest. Younger dune sands, that is, those of pottery and bow and arrow age, in this region are not so weathered or compacted.

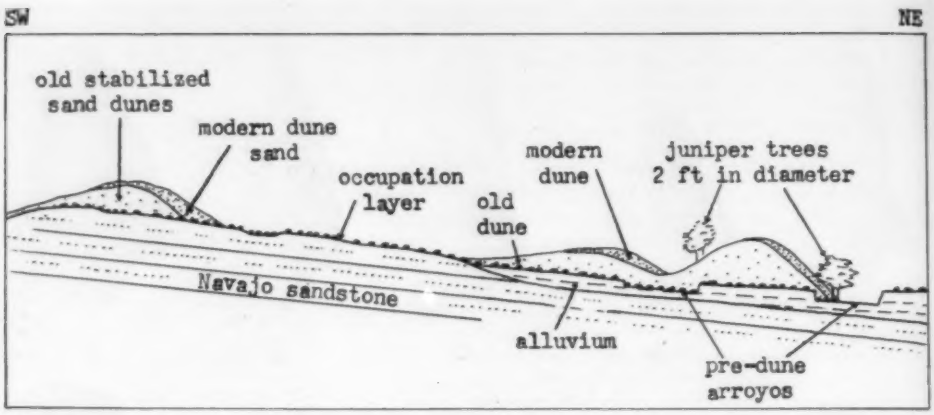

Fig 6. [Hunt and Tanner]. Diagram illustrating geological setting of Moab complex sites near Moab, Utah. The occupation layer rests on bare Navajo sandstone and is overlain by old stabilized sand dunes believed to be early Recent in age. Flakes and well shaped stone artifacts have been washed from the occupation layer onto predune alluvium and into predune arroyos. One artifact was found 4 feet below the top of the alluvium. The occupation evidently is as old as the upper 4 feet of the alluvium; the flakes and artifacts concentrated on top of the alluvium may have been washed into that position from the sandstone benches, or may represent continued occupation.

This weathered sand can be traced from the divide between the Green and Colorado Rivers into the heads of the canyons that drain to the rivers. In the heads of these canyons a thin gravelly alluvium underlies the sand. This gravel is no more than 5 feet thick near the heads of the canyons, but it thickens to at least 10 feet a short distance down them. Prior to its burial by the sand, this alluvium had been dissected by arroyos and a lag gravel of chert, including artifacts, formed on the eroded alluvium.

Unequivocal artifacts (a chopper, sidescraper, and numerous flakes) were collected from the contact between the alluvial gravel and the overlying dune sand. One crudely flaked artifact was found in the alluvial gravel, 4 feet below the top, 2 miles down a canyon from the Moab complex sites. The Moab occupation, therefore, is older than the dune sand. It is as old as the upper beds of the underlying alluvial gravel and may have lasted through the period represented by the erosional unconformity at the base of the dune sand. Modern arroyos incised into the dune sand and in the old alluvium are old enough to have stands of juniper trees up to 2 feet in diameter — trees that evidently are many hundreds and perhaps a thousand years old.

The alluvial gravel and overlying sand was traced from the sites 5 miles northeastward down a canyon to a narrows where a thinner, younger alluvium overlaps the old alluvium and probably overlaps the sand, although this overlap contact was not found. The young alluvium is partly blanketed by the modern dune sand. This young alluvium antedates the present arroyos (which here are at least many hundreds of years old) and probably is the Recent prepottery alluvium (Tsegi) with which the early phases of the Uncompahgre occupation can be equated.

Without paleontological remains the evidence for geologically dating these deposits is not compelling, but the probabilities are that the predune alluvium correlates with other alluvial deposits in the Moab area that have yielded *Elephas* remains. The erosional unconformity and overlying dunes on this alluvium probably date from the period of erosion and wind action that preceded the San Jose complex at Grants, New Mexico (Bryan and Toulouse 1943, Table 2). The reasoning for this correlation is based partly on the similar sequence of deposits and events in the two areas and partly on the similarity in degree of weathering and compaction of the old dunes in the two areas. The Moab complex is no younger than the unconformity, and certainly began while the upper beds of the predune alluvium were being deposited.

The virtual absence of very young alluvial deposits along the washes and the slight amount of arroyo cutting attributable to the present cycle of erosion can probably be explained because the location is practically on the divide between two rivers. The thick, usually older, alluvial deposits are more extensive than the thin younger ones and overlap farther onto divides. Likewise, present day erosion generally is more advanced along the lower parts of drainage courses than at the divides.

The sequence of geological events, and a possible interpretation of them, are as follows:

1. Deposition of an alluvial gravel in the canyons draining from the Colorado-Green River divide. This alluvium probably is late Pleistocene in age.

2. An erosion cycle producing arroyos that removed most of the old alluvium in the upper parts of the canyon but left remnants of the alluvium in irregular small hills. A lag gravel of chert, including artifacts and abundant flakes, formed on this erosion surface. The Moab complex is no younger than this erosion, and certainly started while the alluvium (1) was being deposited.

3. Deposition of the dune sand represented by the old stabilized dunes at the heads of the canyons. This is interpreted as Early Recent, altithermal of Antevs (1948), and probably correlates with the dune sand that preceded the San Jose complex at Grants, New Mexico (Bryan and McCann 1943).

4. Deposition of a younger alluvium farther down the canyon. This alluvium is thought to correlate with the Tsegi alluvium; if so, this event correlates with the early phases of the Uncompahgre occupation.

5. Arroyo cutting and development of modern dunes. In the headward parts of the canyons the arroyos had been cut to their present depth at least many hundreds of years ago, judging by the junipers growing in them. Trees of this size also grow on the old stabilized sand dunes. The lower parts of the canyons, remote from the drainage divide, have a still younger alluvium that is being dissected by the present arroyo cutting.

Interpretations Based on Typology

The association of Folsom and Pinto A projectile points in the Moab complex (Fig. 3) is very similar to the earliest projectile point association (older than the Concho complex) from sites near Concho, Arizona (Wendorf and Thomas 1951, Figs. 47, 48). Although the Folsom-Pinto association in both the Moab and Concho areas is a surface association with possibilities of mixture through reoccupation, the occurrence of the association at two widely separated localities strengthens its validity.

In the Moab area, sites that have yielded the Moab complex with its Folsom points are located apart from

sites of the La Sal complex with its Gypsum Cave points (Fig. 1). The associated artifacts in the two complexes are different, and almost certainly the complexes represent at least two occupations. In other areas both the Folsom and Gypsum Cave points have been reported as associated with the remains of Pleistocene mammals (Harrington 1933; Roberts 1935). At Ventana Cave and at the Lindenmeier site Gypsum Cave types were found above the Folsom layer (Haury 1950; Roberts 1940).

Evidence also suggests that the type of Pinto point (Fig. 2 *a*) which occurs in the Moab complex is older than the types of Pinto points (Fig. 2 *e, f*) which occur in the La Sal complex. On the California deserts, projectile points similar to Pinto A have been thought to be the oldest Pinto type (Rogers 1939: 56–7), and at Ventana Cave the Pinto points most resembling what we call Pinto A were stratigraphically below the levels containing types like Pinto E and F (Haury 1950, Pl. 22).

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RECONSTRUCTION OF PREHISTORIC ENVIRONMENTS THROUGH THE ANALYSIS OF MOLLUSCAN COLLECTIONS FROM SHELL MIDDENS*

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Abstract

In Illinois, the shells of fresh-water mussels are often found in large numbers in the middens of former Indian habitations which were located adjacent to rivers. Living representatives of the species present are usually common in the rivers of the state today. With knowledge

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gained through study of the habitat-demands of the different species as they now live, one is able to reconstruct the environment in which each species existed at the time when the mussels were taken for food. The picture formed by the combined habitat-demands of the different species is a portrayal of the river as it existed at that time. An analysis of the shells taken from a midden on Haw Creek, now often intermittent during summer months, suggests that it was a small river 2000 years ago. Other analyses of shells have shown that decided changes have taken place in other streams.

THE DESCRIPTION of an area as it once existed through an analysis of the remains of animals who lived at that time is not a new subject. A fairly accurate historical description of the earth's surface has resulted partially from our examination of the remains of many animals and plants which have lived at various times on the earth's crust.

Whenever an animal no longer exists on earth today but is found in any type of former situation, usually morphological structures alone must be used in determining its environment. If, on the other hand, a certain animal has been found in situations which represent a past age and still exists in the living state on earth today, the description of conditions as they formerly existed can become far more exact. This fact is due to our not only knowing its morphology, but, far more important, its actual response to its environment. We can discover the type of food which it must eat, the types of terrain on which it lives best, whether or not it requires an aquatic habitat, and many other habitat-demands.

Usually, ecology is concerned with the effects which various factors of environment have on organisms. In the present situation, it is a knowledge of the demands for a certain type of environment as shown by organisms which is of significance. We might say that we are dealing with applied ecology instead of ecology itself.

The fresh-water mussel lends itself well for the purpose of describing a past situation through an analysis of its habitat-demands. In the first place, its shells are present in most of the middens formed by Indians who occupied both the smaller rivers within Illinois and the great rivers which form much of the state's boundary. It is sessile in nature and seldom will move from one position throughout life unless unfavorable conditions such as a decreased oxygen supply, warm water, or toxic gases in the water are present. If movement occurs, an individual will seldom travel over several feet.

Most mussels are quite precise as to the nature of habitat which they demand. For example, some require gravel-bottomed riffles; others, a hard substratum covered with a thin layer of silt with rather slowly moving water over them; still others enjoy a soft mud substratum. It

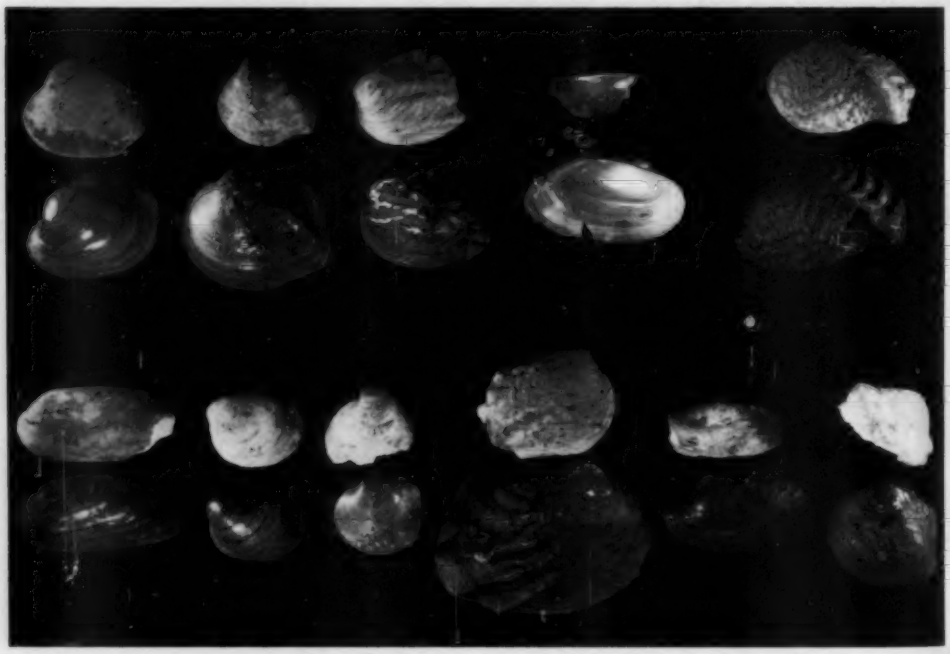

Fig. 1 [Matteson]. Comparison between present-day valves (lower) and those of the same species from Indian middens (upper). From left to right, the species are: (top row) *Lampsilis ventricosa, Quadrula quadrula, Amblema costata, Anodonta grandis, Tritogonia verrucosa*; (bottom row) *Elliptio dilatatus, Obovaria olivaria, Quadrula pustulosa, Megalonaias gigantea, Lasmigona costata, Quadrula metanevra.*

must be stated that there are a few species which are quite undemanding in their selection of a habitat and can live in several situations. These are of little aid as criteria for determining some past environment when found in a collection.

Few animals possess structures which can withstand the ravages of time better than the shells of mussels. They disintegrate very slowly, with the most unfavorable medium being a moist, acidic soil. The bones of birds, fish and mammals are usually well preserved; however, as they may range over a vast area when alive, they allow only a general picture to be portrayed of the area at the time in question.

A valve can withstand considerable erosion before it becomes unidentifiable (Fig. 1). With many species, only the umbo, or first few years of growth is needed as certain constant features on it will allow identification; with others, only the disc is required. With most species, however, a combination of several characters are required in order to cope with loss of form due to erosion of the shell.

Most species of mussels are distributed in a relatively stable pattern from the headwaters of a river to its lower reaches where it may become very large. Within the ranges of several species, there is a gradual and definite change in their shape from the uppermost limits of their ranges to their lower boundaries. Often, as one species of mussel disappears, another species of the same genus will replace it. At any point on a river, one can expect to find a clam community typical of that situation. If anomalies occur within a given stage, such as shallow water where it should be deep, or mud where gravel should be present, the unionid community there will change accordingly.

The process of reconstructing the environment of some past Indian habitation by means of recovered mussel shells can probably be described best by example. The shells were removed from a site of a former Indian village by John P. Wilson, while a student in anthropology at the University of Illinois. The village existed between 200 B.C. and A.D. 300 and represents early Hopewell culture. It is located on Haw Creek 1 mile north of its confluence with the Spoon River; the stream now flows intermittently during the summer. The site is located approximately 3 miles southwest of Maquon, Illinois.

The collection, when identified, revealed the following species, with the one which was most common listed first: *Pleurobema coccineum, Elliptio dilatatus, Amblema costata, Strophitus rugosus, Lampsilis siliquoidea, Actinonaias ellipsiformes, Fusconaia flava, Actinonaias carinata, Anodontoides ferussacianus, Lampsilis ventricosa, Micromya iris, Lasmigona complanata, Alasmidonta marginata,* and *Uniomerus tetralasmus.*

P. coccineum, A. costata, F. flava, A. carinata, L. complanata, A. marginata, and *M. iris,* when found in combination occupy a sand-gravel substratum with definitely moving water of 1 to 3 feet in depth. *S. rugosus* is often found on both pure sand and sand-gravel bottoms. *A. ferussacianus, A. ellipsiformes,* and *L. ventricosa* prefer stretches of fine to coarse sand when in this situation. I have often collected large numbers of *A. ellipsiformes* on a substratum of fine sand within a few feet from shore in clear water not over a foot in depth. *L. siliquoidea,* when found in this community, is often embedded in an almost pure substratum of clay usually near shore.

E. dilatatus, as present in the collection, is a small form and is sometimes given the subspecific name of *delicatus.* Although this species is often found in the Mississippi River itself, *delicatus* is typical of riffles in small streams or larger rivers where the bottom is of sand-gravel and covered with usually less than 2 feet of rapidly flowing water. In this collection was one specimen of *U. tetralasmus.* This mussel is found usually in almost standing water with a substratum well mixed with silt; however, it has been found on occasion in small streams on a sand-gravel bottom.

If one now combines the habitat-demands of the different species represented in the collection, he can form a picture which will represent the area from which the mussels were once removed. We can observe that the general character of the unionid community taken from a river at any given level is instrumental in describing the size and general appearance of the stream at that point. Each species of mussel which is a member of this community, on the other hand, requires a specific habitat within the general environment. The combined habitat-demands of all species present will portray the total environment.

A community of mussels, when in the preceding combination, is typical of a small river of 15 to 25 feet in width, with depths of roughly 3 feet. There must have been a decided current, with riffles probably present. Had slowly moving water with a silt substratum been present within the area searched by the Indians, certain species such as *Anodonta grandis, Leptodea fragilis,* or *Proptera laevissima* would have been present. Large areas of the substratum were composed of sand from shore outward, with the middle of the stream being composed mainly of sand and gravel. Occasionally, areas of clay were exposed by stream action.

The deeper portions at bends in the streams could have had thin layers of silt overlying the firmer materials; several species of mussels of this community live well in this situation. The pH of the water was about 8.0. The water was clear as shown by the presence of several forms which prefer low turbidity.

Once the character of the stream bed has been ascertained for the area from which the shells were removed, further reconstruction of the surrounding terrain is often possible. Usually, the composition of the substratum reflects the texture of terrain nearby. From use of the knowledge gained, one can estimate with varying degrees of accuracy the different plants and animals which lived adjacent to the river.

When a unionid community is composed chiefly of forms which select a silt or mud bottom, little can be learned concerning the adjoining terrain. These materials are deposited where the river bed is so level that water velocity can no longer carry relatively heavy particulate matter. Observation has shown that this situation

can exist when the stream has cut deeply through a soft terrain with the formation of steep banks on either side, or where a flood plain has been developed to the extent that the stream meanders through it.

The extreme importance of saving mussel shells which are found in Indian middens, regardless of a collection's age or size, can well be emphasized by mentioning a few examples of my observations. One large collection of shells, roughly 7000 years of age, was removed by John C. Mc.Gregor and his staff from the Chrisman site, an Archaic site near the confluence of a small stream (McGee's Creek) with the Illinois River. Today, the stream meanders sluggishly through an almost level flood plain 5 miles in width, and is devoid of mussels. The most prevalent mussel in the collection, *E. dilatatus delicatus*, along with several other forms, demands a habitat of rapidly flowing water or riffles with a sand-gravel substratum. The habitat-demands of these mussels which were removed from the stream, then a small river, indicate that the flat flood plain and bluffs present there today were then lacking, and that, instead, a decidely inclined slope covered the same area (Matteson 1959).

Another collection presented to me by Mc.Gregor came from the Poole site which was occupied by Indians of early Hopewell culture who lived about 500 B.C. (Matteson 1953). The village was located on the bank of a stream, McGee's Creek, which today is only a few feet wide, with a bed of clay and broken rock, and usually not over 1 foot in depth. Often, it becomes a series of pools during the drier parts of the summer. It flows between vertical, clay banks which are roughly 15 feet in height. No mussels have been found in it. An analysis of the collection revealed that, according to the habitat-demands of the mussels, this stream at the time when the shells were removed, was a river which was from 30 to 40 feet in width, with depths upward to 3 feet. No noticeable banks had formed at the water's edge. The substratum consisted primarily of sand or sand-gravel over which the water flowed with definite current. A survey of the vicinity made after the river had been described, verified the presence of the former shorelines.

Whenever possible, the shells which are included in each collection are measured for length, height and width. After the shells of the Chrisman site were measured in this manner, it was discovered that individuals of the species then present, with the exception of a few forms which habitually occupy cold water, were decidedly smaller than representatives of the same species are today. Interestingly enough, individuals of several other subsequent collections representing approximately the same period, 7000 to 9000 years ago, have also been persistently smaller than their counterparts of today.

Dwarfing among fresh-water mussels is a condition which is observed occasionally today. It can be caused by water temperatures which are persistently lower than those to which the mussel is adjusted. The condition may also result from a continued lack of sufficient food.

The presence of a stunted condition, as exhibited by all collections of mussels received to date which lived from 7000 to 9000 years ago, may be interpreted as evidence that the area involved was then subjected to lower temperatures than those which exist there today. Although the Pleistocene epoch had ended as such, the lowered temperatures which caused it probably persisted for many years. The rate of temperature increase has been a source of speculation.

The period of the year during which the shell of a mussel is increased in size by the addition of calcium carbonate to its periphery is dependent upon the annual mean temperature of the water in which it lives. In Illinois, this period extends approximately from April to the following October.

If, at the time in question, the annual mean temperature was lower than it is today, the period for growth each year would have been shorter. Because of this, the clam, when of mature age, would have been smaller in size. Furthermore, with a lower annual mean temperature, microscopic plant life would have had a shorter growing period, thus creating a smaller food supply for the included microscopic animal life; as a result, the mussels would also have had a decreased food supply. Finally, it is probable that because of the proximity of the Pleistocene epoch, little organic detritus which would act as fertilizer would have accumulated. The aquatic vegetation would have been affected accordingly; again, the phytoplankton and, indirectly, the zooplankton would be diminished in amount when compared with conditions of today. This fact would also contribute to the mussels' small size.

The ecological studies of shells from middens well illustrates the interrelation between several scientific fields. The descriptions of former environmental conditions are of interest to both anthropology and historical geology. The collections denote both the species of mussels present and their distribution during the past; this information, in turn, can be correlated with contemporary species in the state and their distribution.

Acknowledgments. It is evident that as a zoologist, I have been completely dependent upon anthropologists for the collections which were studied. With few exceptions, the many collections which have been analyzed have been enthusiastically provided by John C. Mc.Gregor, Professor of Anthropology, University of Illinois, and other members of his staff. Data of extreme importance have been secured from collections given by another anthropologist in the same department, Elaine Bluhm.

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University of Illinois
Urbana, Ill.
January, 1960

REVIEWS

Edited by Donald Collier

An Introduction to Anthropology, second edition. Ralph L. Beals and Harry Hoijer. Macmillan, New York, 1959. xxi+711 pp.+x, 123 figs., 13 charts, 4 tables, 7 maps. $6.90.

Readings in Anthropology. Morton H. Fried. Crowell, New York, 1959. Vol. I: Physical Anthropology, Linguistics and Archeology. xi+482 pp. $3.00. Vol. II: Cultural Anthropology. ix+598 pp. $3.25.

Man in the Primitive World, second edition. E. Adamson Hoebel. McGraw-Hill, New York, 1958. xvi+678 pp., illus. $9.00, text ed. $6.75.

The World of Man. John J. Honigmann. Harper, New York, 1959. xii+971 pp., illus. $7.50.

Cultural Anthropology. The Science of Custom. Felix M. Keesing. Rinehart, New York, 1958. xxv+477 pp., illus. $6.00.

Introduction to Cultural Anthropology. Mischa Titiev. Henry Holt, New York, 1959. xiv+464 pp., 127 illus., map. $6.00.

It is a curious phenomenon of our professional life that archaeologists (like physical anthropologists) do not presume to author general introductory anthropology texts — despite their professed faith in the basic importance and equal status of their respective branches of the discipline. No such modesty seems to afflict the cultural anthropologist or ethnologist who, at the drop of a hat, will produce an imposing work on the science of man which roams freely over subjects usually outside the author's field of competence. Since these subjects are also outside the author's field of interest, they inevitably come out second-best in terms of space and treatment — despite theoretical acknowledgment of their coordinate status within the discipline or lip service to the significance of their roles. The result has usually been either a cursory outline — 5% to 10% of the text in the case of archaeology — or a third-hand compilation prone to error and lacking the requisite enthusiasm for the subject matter. In view of the obvious popularity of archaeology among students, it is ironic that it should be treated for the most part as a stepchild by the text-writing fraternity; doubly ironic in the face of the fact that one-third of the professional anthropologists in the United States are archaeologists.

As an example of this situation, let us compare the coverage and treatment accorded to archaeology in half a dozen of the latest textbook offerings.

Keesing lists archaeology as one of the five recognized fields of anthropology but has chosen to emphasize ethnology and social anthropology, treating the remaining fields only to the extent necessary to make fully clear their contributions to an understanding of culture. Twenty-three pages out of the total of 425 are devoted to "The Growth of Culture" and the specific contributions of archaeology to this problem. In this brief compass he manages to discuss the nature of archaeology and its procedures and terminology as a special discipline; the standard periodizations of man's history; the origin and early development of human culture; and the origins and consequences of food production. His survey is necessarily very limited and generalized, but it is world-wide in scope, competent, informed and perceptive. The author's awareness of the historical approach is evident throughout the book, and one can only regret his decision to orient the work in other directions.

Hoebel's text professes to be an introduction to general anthropology, of which (according to a diagram on page 4) archaeology is one of the three principal divisions. We are told that the section dealing with prehistoric culture has been completely rewritten and expanded for this new edition — yet it occupies only 41 out of a total of 621 pages. Twenty-five of these are devoted to a study of the Paleolithic and Mesolithic stages, the remaining 16 to the Neolithic, Bronze and Iron ages. The survey is well balanced as far as it goes, but is confined to Europe and the Near East with no mention of the growth of civilization in eastern Asia or the New World. In addition, one paragraph in the introductory chapter is allotted to archaeology as a science and a method. The illustrations, however, deserve honorable mention.

Titiev disclaims any intent to give equal weight to all branches of anthropology as did his earlier *Science of Man*. Still, the "brief synopsis of prehistory" which he offers occupies one-sixth of the present text. There is, however, no discussion of method or of the role of archaeology; and only 8 pages out of 74 are devoted to the New World, while East Asia is ignored. The treatment is rather conventional but it is clear and easy to read, with due attention to ways of life in prehistoric times. One might argue with an occasional statement but find no serious fault. There is a fair complement of illustrations.

Beals and Hoijer aim to give "a well-rounded view of the discipline," but although they identify archaeology as one of the three branches of cultural anthropology, they allot only about 10% of the space in their new edition to it. Three pages in all are devoted to the nature and contributions of archaeology as a discipline, and there is a short (4-page) discussion of methods and procedure. The text is clearly written, up-to-date, more informative and less discursive than Titiev's, and reasonably well illustrated. It has one major fault in that the material on archaeology is scattered through the book and buried under other headings; it could at least have been segregated in readily identifiable chapters. Thus, the reader will find a statement on the nature of archaeology on pages 10–12, introductory remarks on prehistory pages 56–7, a discussion of the sequence of

Paleolithic cultures on pages 63–73, the question of Australopithecine industries on pages 74–6, the artifacts of Peking Man on pages 79–80, and brief remarks regarding Africa on page 96. He must then skip to pages 252–7 for a discussion of field methods, followed by a 27-page survey of "culture history" which describes the life of prehistoric man from the Paleolithic to the Urban Revolution, with 12 pages devoted to the New World. In the following chapter, which deals with the technology of primitive peoples, we find a discussion of stone-tool fabrication (pages 290–302); and some of the subsequent material on metallurgy, pottery, and such, is also pertinent to archaeology. It is unfortunate that the presentation is so disorganized, as the material is for the most part quite satisfactory as far as it goes.

Honigmann, author of *The World of Man*, is principally identified with personality studies. His handling of archaeology is the most pretentious but perhaps the least satisfactory. Archaeology for him is one of six fields of cultural anthropology: occasionally useful but — one cannot escape the impression — somewhat superfluous. Knowledge of the past, we are told, is useful for understanding the present, but not essential. "One may come to understand an existing culture (or, in fact, any event) without knowing its antecedents." Nevertheless, 117 out of his 881 pages are assigned to archaeology. An early chapter (15 pages) deals with field methods, interpretation and dating; the remainder of the subject is relegated to the end of the book under the heading "Growth of Western Culture." Honigmann starts out here with the Middle East (39 pages), which is discussed in terms of Steward's stadial scheme and carried well into the historic period. He then switches abruptly back to the Paleolithic and Mesolithic of Europe (19 pages), followed by a tedious discourse on the later European periods (34 pages). "Growth of Western Culture" then somewhat incongruously concludes with a scant chapter on "Man in the New World" (10 pages), which confines itself to the area north of Mexico. One wonders why the author bothered to include it.

The visual aids so important in presenting archaeological data are represented by a plethora of charts, graphs and tables but an appalling lack of illustrations (a total of eight in the 102-page survey of prehistory).

Whether justly or not, the text creates the impression of being a set of notes and quotations from various authors hastily strung together rather than a coherent composition representing Honigmann's own views and interpretations. The style will repel many students. Despite the author's professed aim "to omit many details and attempt meaningful synthesis," the presentation will be difficult reading for the beginner and will give him few clear impressions because the main points are swamped in a mass of detail, much of which would be presented better in illustrations. In short, the approach is encyclopedic rather than introductory and results in making an intrinsically fascinating subject seem dull and boring. Unlike the preceding textbooks, there are no suggested readings to guide the interested student, and only sporadic documentation for the academic critic.

We can only deplore the Victorian ethnocentrism that devotes so much space to the minutiae of late prehistoric Europe and virtually ignores East Asia, India, Africa and most of the New World — where culture processes can equally well be illustrated by archaeology.

The text contains such an unfortunate number of misleading or questionable statements of fact that one's confidence is shaken; nor is it restored by the charts, where we encounter the "Koma," "Ertbølle" and "Latine" cultures. Regretfully, one is forced to prefer a cursory 20-page summary of prehistory that is at least reliable. An irritating affectation is the constant promotion of unfamiliar German *Beigaben* for "grave goods."

Fried's work is not strictly comparable with the rest, being a collection of readings rather than a textbook. But from the viewpoint of the archaeologist it clearly stands out. Fried rates archaeology as one of the four main component fields of modern anthropology and allots it 222 out of a total of 1057 pages in his two volumes. His selections are excellent and form a well-balanced whole, with the New World receiving a fair share of attention. In the opening section we find theoretical papers by Phillips and Hawkes and a discussion of radiocarbon dating by Libby, while field methods are deftly dissected by Ward and O'Leary. The early stages of prehistory are represented by Dart and Childe for the Old World and Roberts for the New. The Neolithic section reprints the recent Braidwood-Kenyon controversy from the pages of *Antiquity*, plus Braidwood's latest synthesis in *Science*. A final section, "The Rise of Civilizations," presents the views of Childe, Willey, and Steward, and thus affords a balanced global coverage as well as stimulating interpretations by our leading broad-scale synthesizers.

In conclusion, we can say that as a group the textbooks are characterized by inadequate treatment of our discipline: inadequate in terms of space, in terms of coverage and in terms of presenting archaeology as a specialized science with its own problems and techniques. In view of the brevity of the typical presentation, specific criticism of content is difficult. But in general, any discussion of the value, role and special qualities of prehistoric archaeology comparable to that found in Kluckhohn's *Mirror for Man* is conspicuously lacking. The exclusively western orientation of most of the surveys of prehistory is also a deplorable bias on the part of any anthropologist: it is precisely this sort of ethnocentrism that our profession supposedly tries to avoid. The beginning student should be taught to view the development of human culture on a global scale: the history of *man*, not the history of any group of men. We do not, after all, restrict our treatment of human evolution solely to the development of the European races. In a rapidly shrinking world it is questionable whether we can longer afford the conventional parochial approach in any branch of the study of man.

In sum, a balanced introduction to the field of anthropology with a satisfactory treatment of archaeology, has yet to appear.

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Approach to Archaeology. STUART PIGGOTT. Harvard University Press, Cambridge, 1959. x+134 pp., 12 figs., 8 pls. $3.00.

A considerable number of little books on archaeology have appeared in the last 15 years. They are usually addressed to beginners, and most have concentrated on field activities. Piggott's book is an attempt to present more fully to the same group of readers the "ideas and concepts which direct archaeological operations." The result is simply another example of the disappointingly rudimentary state of systematic theorizing in archaeology. American readers will be surprised to find that quantitative methods of description and comparison are not discussed at all, and readers of any nationality will have a difficult time trying to make anything out of the discussion of typology. I think that we have had altogether too many brightly titled little books; we need a big book with a dull title (something like *Principles of Archaeology*) which does a thorough and elegant job of abstracting and exemplifying the fundamental operations of archaeological reasoning.

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Native Peoples of South America. JULIAN H. STEWARD AND LOUIS C. FARON. McGraw-Hill, New York, 1959. xi+481 pp., 110 pls., 4 tables, 13 maps. $11.50, text edition $8.50.

From 1946 when Julian H. Steward had finished organizing, editing and producing the six volumes of the *Handbook of South American Indians*, Bulletin 143 of the Bureau of American Ethnology of the Smithsonian Institution (1946–50) he always spoke of producing a one-volume "handbook" stripped of the mass of descriptive detail and organized around the various theoretical ideas that had developed throughout this task. With the aid of Faron, he has now written such a book. Both authors in the preface state that the book "is a general summary of the *Handbook*." Although they made an effort to incorporate some new materials, especially in archaeology, that change some of the theoretical viewpoints of the six-volume *Handbook*, it is unfortunate that a little more effort along these lines was not applied so that this one-volume work would be factually up-to-date as of 1959. As it now stands, in some areas, such as coastal Ecuador, the mouth of the Amazon, and the Guianas, the latest data from recent archaeological excavations are included. However, for Argentina, Colombia, the middle Amazon, Venezuela as a whole, and the Lesser Antilles not one item of the last ten years of archaeological research is mentioned. As a result some of the theoretical framework is based on weaker evidence than necessary, for in many cases the new data offer a firmer foundation for many of Steward's and Faron's theoretical assumptions.

Following the *Handbook*, five basic cultural levels of development are used: Marginal, Tropical Forest, Circum-Caribbean and Sub-Andean, and Andean. Many readers who objected to this arrangement in the *Handbook* will find the same objections here, but the system does provide a framework for the vast amount of data, whether or not one agrees completely with all the subdivisions or the theoretical grounds upon which this classification is based. The book has the following chapters: South American Culture in Perspective; Foundations of New World Cultures; Environment, Production, and Culture; The Central Andean Civilizations: Prehistoric Eras; Native Central Andean Culture of the Historic Era; Chiefdoms of the Circum-Caribbean Area and Eastern Bolivia; Warring Chiefdoms of the Northern Andes and Central America; Theocratic Chiefdoms of Venezuela and the Greater Antilles; Chiefdoms of Eastern Bolivia: Tropical Forest Chiefdoms; Farmers and Pastoralists of the Southern Andes; Farm Villages of the Tropical Forests: General Features; Varieties of Tropical-forest Villages: Nomadic Hunters and Gatherers: General Features; Varieties of Nomadic Hunters and Gatherers; Retrospect and Prospect.

The only major amount of any new ethnographic data added to the book are those on the Atacameño, Diaguita, and Araucanians by Faron, the Mundurucú from the Murphys' fieldwork, and the Warrau from recent fieldwork by Johannes Wilbert. The recent linguistic classification by Greenberg is mentioned in a footnote. However, a good set of heretofore unpublished photos from Abraham E. Guillén of the Museo de la Cultura Peruana of Lima offers some pleasing new views of the way of life of the various peoples of the Central Andes and part of the eastern slope of Peru. Illustrations are unevenly chosen, however, and some chapters have practically none. For a "one-volume *Handbook*" this is unfortunate, but more pictures would have priced the book into a level even more prohibitive than at present. The only time the selling price might seem low is if one has recently tried to obtain the out-of-print volumes of the *Handbook*, and discovered that individually each one is now considered a rare book, priced accordingly.

This review is not going to list a series of minor errors, for any serious student will soon find them. But it is important for the reader to understand that by leaving out some of the recent findings in various parts of South America certain sections of the book are misleading and often erroneous. For example, there is no reference to the excavations of Alberto Rex Gonzalez in the deep stratified deposits at Intihuasi Cave in north central Argentina and the extensive surface finds of J. M. Cruxent from El Jobo in northern Venezuela, which

have contributed greatly to the definition of the paleo-Indian horizon. The preceramic horizon of gatherers and fishers and the beginnings of agriculture on the coast of Peru is now known not only from Bird's important finds at Huaca Prieta but also from dozens of other sites of a similar nature, which have been found and published on by Engel and Lanning. The Chibcha are handled in the traditional manner without recognition of the work of Haury and Cubillos, which suggests a different interpretation of this "high" civilization of Colombia, although I realize that there are differences of opinion on this subject. Many readers will feel that even though Steward and Faron wished to continue the viewpoint originally advanced by Steward and others in the *Handbook* about the Circum-Caribbean culture area and Circum-Caribbean level of culture, they should at least have taken into consideration and mentioned the numerous articles that have suggested other points of view on this subject since the original formulation appeared in the *Handbook*.

Regardless of these criticisms, which are meant to warn the reader of the necessity of viewing some chapters and paragraphs with caution and of the need of going to the literature for more information, the book has an important place in anthropological literature on the New World. Constantly the lay public and students inquire about a single volume that will give them a quick summary of South American aboriginal culture and its development. Also, there are many professionals who are too busy in their own area of specialization to read the extensive literature on South American anthropology. Until a more complete and up-to-date volume appears *Native Peoples of South America* by Steward and Faron can be used to fill such needs.

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The Incas of Pedro Cieza de Leon. Edited, with an Introduction by Victor Wolfgang von Hagen; translated by Harriet de Onís. University of Oklahoma Press, Norman, 1959. lxxx+397 pp., 33 plates, 4 maps. $5.95.

Cieza de León was not an eyewitness of the European invasion of the Inca state. He entered Inca territory 15 years later, during the civil wars, coming from Colombia, where he had soldiered and settled for more than a decade. But he was the first chronicler to describe the various Inca "provinces," one by one and, extremely rare among his contemporaries, he had an eye for ethnographic and occasionally even archaeological detail. He was aware that many of the peoples of this area were distinct from their Inca conquerors, and as he traveled he would try to unravel which types of architecture, ornamentation, or clothing were aboriginal and which imported from Cuzco. As ethnohistoric work has progressed in the Andes, Cieza's reputation as an accurate and sensitive observer has endured and grown.

Until now, readers who could not consult the chronicles in the Spanish original were forced to rely on a 19th century translation by Clements R. Markham. Unfortunately, as was pointed out in 1936, and again in 1937 by Bailey W. Diffie in the *Hispanic American Historical Review*, that version contained many and seriously distorting errors. The present translation by Harriet de Onís is a great improvement; Markham's mistakes have been corrected, the paragraphs he had prudishly censored have been restored, and the text is now good reading as well as accurate.

Von Hagen's editorial contribution is three-fold, two parts competent and one disappointing. First, he has drastically re-arranged chapters from the first two parts of Cieza's chronicle in such a way that one finds data on Inca history and institutions from the second part shuffled into the context of geographical description taken from *Parte Primera*. This job was done with considerable skill. Depending on one's research, one might quibble about this paragraph or that, but on the whole, chapters omitted are either repetitious or deal with events after the European invasion.

The editor's second contribution is a good 50-page introduction dealing with Cieza's life and work. He raises again the puzzle of this amazing youth who arrived in the New World at the age of 13, spent almost 20 years in the battles of invasion and civil wars, and yet found time for contemplation, the taking of ethnographic notes, and the interviewing of contradictory informants. While he includes little new material on Cieza's background and childhood in Spain, von Hagen did have access to documents dealing with Cieza's return to the peninsula, the publication of *Parte Primera*, his marriage and premature death. Originally published by Miguel Maticorena Estrada, these documents are included here in translation.

The third and disappointing part of von Hagen's contribution appears in the large number of explanatory footnotes accompanying the new translation. The notes are a grab bag in the deplorable tradition of Horacio Urteaga's annotations to his Lima edition of the chroniclers. Like the maps, they lean primarily and much too heavily on the editor's still unpublished study of the Inca roads. Most issues of Inca social, economic, and political organization are side-stepped with observations like the one about the "beauty and perfection" of the *aclla*, the chosen women; "they were considered fortunate," we are told. "As a language Quechua has marked characteristics: its closest related tongue, morphologically, is Aymara (which centers about Lake Titicaca and is spoken exclusively in Bolivia)." Beyond such clichés, which are really distortions, there are too many touches borrowed from the heavy, jocular vein of the tourist guidebook. The notes include the unexpected announcement that the editor has prepared for publication Iñigo Ortiz de Zúñiga's remarkable 1562 *visita* to Huánuco, which has been appearing intermittently in the *Revista del Archivo Nacional* (Lima) ever since 1920.

In taking the initiative for the publication of this translation von Hagen is right in emphasizing the debt we all owe to Cieza. For vast areas of Colombia and Ecuador he is virtually our only source. Von Hagen notes that Cieza was also curious about minutia like some decayed buildings at Huari, near Huamanga, which seemed to him "not of the sort the Incas built . . . for this building was square, and those of the Incas, long and narrow," so he asked the local inhabitants about it. He remembered their answers hundreds of miles to the south, at Tiahuanaco. "I asked the natives . . . if these buildings had been built in the time of the Incas, and they laughed at the question, repeating what I have said, that they were built before they reigned" by some bearded men, same as the structures at Huari.

Archaeological verification of 16th century sources is not yet a routine aspect of Andean research. Dorothy Menzel's studies for von Hagen's Highway Expedition have shown how much can be expected from such confrontation; Cieza de León was their primary source. The Menzel-Riddell excavation of a *tampu* way station has not yet been described in print, but there is little doubt that archaeology can make a real contribution to the study of such aspects of Inca economic organization as the warehouse system, which can be mapped from the chroniclers, but which requires thorough excavation before its economic functions can be fully understood.

The student of Andean prehistory will continue to consult Cieza's work in the original and there is hope that soon Maticorena will be able to publish the first complete edition, in any language, of Cieza's chronicles. However, von Hagen and Mrs. de Onís have provided us with a book in English which can be given without reservation to the serious, if not professional, reader interested in the Incas. It is the first time since Prescott that we can say this.

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Cultura Valdivia. Clifford Evans, Betty Meggers, and Emilio Estrada. Publicación del Museo Víctor Emilio Estrada, No. 6, Guayaquil, 1959. 128 pp., 81 figs., 5 tables.

The subject matter of this monograph is the earliest of a series of cultures recently discovered in coastal Ecuador. The Valdivia culture has been discussed in two previous publications of Museo Victor Emilio Estrada, but the present monograph presents for the first time the basic data from the stratigraphic excavations in Valdivia middens. The unique nature of Valdivia culture and the importance of this complex to further discussions of the cultural dynamics of northern South America and of contacts between Mesoamerica and South America at an early time level make the monograph under discussion a primary source absolutely essential to all serious students of South American archaeology.

The presentation of the results of the excavations is a model of organization and clarity. The report starts with a brief general statement of the nature and significance of Valdivia culture and proceeds to describe the six sites of this culture already discovered. The sites are typical shell middens, but their location a short distance back from the present shore indicates a gradual uplifting of the coast since the localities were inhabited. Excavations at two sites are described, but only at the Valdivia site was the midden of sufficient depth to yield chronologically useful results.

The artifacts from the Valdivia site are analyzed in detail. The cultural inventory of shell and bone artifacts is skimpy with two shell fishhook fragments being the most significant items. The products of the stone-working industry were more numerous, but not at all prepossessing. Among these crude tools, showing remarkedly little skill in execution or underlying cultural pattern, net sinkers and manos and metates are noteworthy.

Since ceramics made up the bulk of the collections, it is fitting that ceramic analysis should occupy most of this report. The 36,096 sherds used in the analysis were examined to determine the significant variations in lip and rim form, base form, and total vessel shape. The sherds were then reduced to a number of ceramic types conceptualized largely in terms of surface treatment and decoration. This descriptive section does not make particularly interesting reading but provides a thorough presentation of the data necessary to compare the Valdivia ceramics with those of other cultures. After two careful readings of this section I had only one minor and utopian criticism: I would have liked quantification of the statements that certain kinds of tempering materials tended to be associated with certain decorative techniques.

The ceramics are all in one tradition, but the site was occupied for a length of time sufficient to encompass considerable ceramic change so that the authors feel justified in dividing the occupation at the Valdivia site into four periods designated from early to late as A, B, C, and D. The boundary between Periods A and B is most clearly marked by the appearance of several new traits of ceramic decoration.

The most remarkable ceramic artifacts other than pottery are the distinctive, stylized, human figurines which occurred in all periods of the occupation except the earliest. The figurines, usually female, are markedly different from all other groups of figurines so far discovered in the New World.

Information on the occurrences of all food remains (shell, fish bone, mammal bone) is carefully tabulated and excellent use is made of these data in discussing the economy of the inhabitants. The small, fairly sedentary, groups responsible for these middens derived by far the greatest part of their sustenance from mollusks and fish, but their use of the mano and metate shows that vegetable foods were not entirely neglected. The authors discuss whether these people were familiar with agriculture and reasonably conclude that it is probable that some form of incipient cultivation was practiced. The fairly well-made ceramics, showing a number of stand-

ardized forms and a number of types of decoration, and the care and skill lavished on some of the elaborately decorated vessels suggest a level of sophistication much higher than one might anticipate on the basis of the economy. The numerous and well-made human figurines also seem somewhat out of place in a shellfish gathering culture. Even before one inquires into its antecedents and chronological position, the Valdivia culture appears anomalous.

Evans, Meggers, and Estrada have found sufficient evidence to indicate that Valdivia is earlier than Chorrera culture. Chorrera, dating well before the time of Christ, has well developed maize agriculture and ceramics which show undisputable evidence of Mesoamerican derivation. From this information one might anticipate that Valdivia culture was early, but one would scarcely anticipate the radiocarbon dates obtained on shell samples from the Valdivia site. One of these, 4450±200 B.P., comes close to dating the beginning of occupation at the site, while the other two, 4190±200 and 4050±200 B.P., date levels within Period B. These dates are in proper stratigraphic order and if they are taken at face value, Valdivia becomes a rival of the Early Woodland cultures of New York State for the honor of having the oldest dated pottery in the New World.

In the final section of this report the authors attempt to fit Valdivia and its startling dates comfortably into the present patterns of thinking on cultural development in Mesoamerica and South America. Their brave attempt fails to convince me on several points.

In their discussion of the place of Valdivia in the culture history of Nuclear America the authors make use of comparisons with four other archaeological complexes. These are Early Guañape on the North Coast of Peru, Barlovento on the Caribbean Coast of Colombia, Monagrillo on the Pacific Coast of Panama, and Tlatilco in the Valley of Mexico. They believe that they point out sufficient similarities among Guañape, Valdivia, Barlovento, and Monagrillo cultures to advance the hypothesis that all four are the result of the north to south migration of a people with a shellfish gathering economy. The traits which separate the later periods of Valdivia from period A are attributed to a second migration or wave of influence out of Mesoamerica into Ecuador. A table is presented to show that some of these traits are shared by Valdivia and Tlatilco. The authors do not believe that Tlatilco is the actual source of these ideas, since it is too late in time, but they feel sure that the source of these ideas is to be found somewhere in Mesoamerica.

This evaluation of Valdivia does not seem to be completely demonstrated on the basis of the data presented by the authors. The reservations which I hold concern both the nature of the cultural comparisons among the five sites discussed and the way in which the available radiocarbon dates are used by the authors to bolster their argument.

In their attempt to demonstrate cultural relationships the authors use a list of traits, most of which are generalized. For instance, Valdivia and Guañape are shown to share such elements as coarse sand tempering, fine sand tempering, polished surfaces, unpolished surfaces, broad-line incision, narrow-line incision, punctation, and certain similarities in vessel and rim form. On the basis of a tabulation of individual traits the authors intimate that the two complexes are closely related. Yet when one turns to the primary sources on Guañape ceramics and compares the total structure of the Guañape ceramic complex with the total structure of the Valdivia ceramic complex, one immediately sees that the two are not particularly similar when viewed as a whole. The common vessel shapes of Guañape are not the common vessel shapes of Valdivia and even in certain instances where there are similarities in rim profile, the similar rims are associated with different vessel shapes in the two complexes. Similar lists of individual traits might have been prepared for other sites in northern South America. With the lower levels of Momil in northern Colombia Valdivia shares, along with some of the traits mentioned above, indented strip appliqué; zoned, fine line cross hatching; cross brushing or combing; solid female figurines; and most specifically, small models of zoomorphic, tetrapodal benches or thrones made of fired clay, which seem to have been designed as seats for clay figurines.

In short, I find the evidence for close connections between Guañape and Valdivia much less convincing than the authors seem to. It is possible that a somewhat stronger case could be made for close relationships among Valdivia, Monagrillo, and Barlovento, but a clearer demonstration of such a relationship should be made by some method other than the listing of discrete traits.

There are several points in the section on radiocarbon dating which need examination. The date which is quoted for Tlatilco is too early for the traits which the authors are attempting to derive from a Mesoamerican source. These traits, such as excision and rocker stamping, are not found in the bottom of the Tlatilco sequence but appear in the Valley of Mexico between 1100 and 800 B.C. The use of the dates of 5750±200 and 4300±200 B.P. for Middle and Early Guañape in preference to the much later dates based on vegetal materials implies that the authors regard as worthless most of the rest of the radiocarbon dates determined in Peru, since most of the latter, especially the long series of dates from Huaca Prieta, clash hopelessly with these two extremely early dates. Incidentally, the series of dates from Huaca Prieta contains one based on shell which dates the middle of the preceramic period, stratigraphically well below Early Guañape, at 3572±220 B.P. The great majority of radiocarbon dating done in Peru would bracket the arrival of pottery on the North Coast between 1500 and 1000 B.C. If this dating and the dating of Valdivia are accepted, then Valdivia is contemporary with the preceramic culture of Huaca Prieta and not with Guañape. Such an alignment is a problem only if one believes that Early Guañape and Valdivia are closely related. The authors' handling of this point raises the question as to whether they regard radiocar-

bon dates obtained from shell as being directly comparable to those obtained from other materials.

The date of 4090±70 B.P. for Monagrillo indicated that this culture was in part contemporaneous with Valdivia. The occurrence of excised pottery here and at Valdivia about 1000 years earlier than this trait can be dated in Mesoamerica suggests a possibility, for future consideration, that some ceramic traits may have been moving from south to north in Nuclear America.

The crux of my criticism is that I find Valdivia culture a good deal stranger than the authors seem to. I believe that the very early dates for the Valdivia culture harmonize well with its unique nature, and are, for that reason, credible. Further, I believe that much more work must be done in northern South America and lower Central America before the Valdivia culture can be fitted comfortably into an over-all developmental scheme. Luckily the descriptive sections of this report are so admirable that Valdivia can be readily compared to further relevant archaeological materials as they come to light.

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Maya: the Riddle and Rediscovery of a Lost Civilization. CHARLES GALLENKAMP. David McKay, New York, 1959. xvi+240 pp., frontis., 46 photographs, drawings by John Skolle, map. $5.50.

The author is a research associate of the *Instituto Interamericano* of Denton, Texas, whose director, Carl B. Compton, justifies a new book of general coverage on the ancient Maya in a preface: "Much has been written of the Maya; by and large this has been either rather technical archaeological writing or it has been journalism. The former is usually too specialized or tedious for the ordinary reader; the latter too often sacrifices truth for romantic effect."

Gallenkamp thanks the *Instituto* and its director "for the generous and continuing cooperation afforded me in planning and conducting the series of expeditions during which much of the contents of this book, photographic and otherwise, were collected." Compton notes, however, that the book is not presented as the result of personal field work. Rather it is a synthesis based on the work of other scholars in the Maya field. It should be judged as an attempt to simplify the present Maya picture for a wider circle of interested laymen. Though many sources were used, inevitably it relies heavily on two not unsuccessful recent works covering the same field: S. G. Morley's *Ancient Maya* as revised by George W. Brainerd (1956) and, especially for interpretative ideas, J. E. S. Thompson's *Rise and Fall of Maya Civilization* (1954).

The book seems to me to be a reasonably successful effort to achieve compression and dramatic effect without serious sacrifice of "truth." However, this has involved sacrifice of all but a very small ration of adequately described archaeological facts. The book is mainly concerned with the excitement of discovery, and with ideas and interpretations. Unsolved problems and conflicting opinions are not neglected, and are fairly presented to "the general reader." One hopes he will be inspired to look further.

I turn to some criticisms, meant to be constructive in connection with any future revision. There is no map or drawing of a complete ceremonial center. A map locating many sites is given, but the reader is not made adequately aware of the regional diversity of the Maya area as a whole. As background information, we are told of the linguistic diversity of the American Indian in general, but not of that in Mesoamerica and even within the Maya part of it. The reader is made aware of the chronological implications of the inscriptions on the stone monuments, but little is said about the "art" on them as documents, and sequence in art styles.

A few slips as well as omissions are inevitable in such a work as this. A number of questionable or erroneous positive statements or impressions may be noted, with page references. The Dresden Codex is said to deal largely with astronomy (23); astronomical inscriptions can be read without difficulty (64); the inscription on a stone monument records "the *exact moment* of dedication" (88, italics mine); head-variant glyphs were ordinarily reserved for a special type of text (99); ball courts were provided with long rows of stone benches, as in a stadium or amphitheatre (93); each new cult was provided a shrine (119); Maya artists never worked with other than human and symbolic forms, and their figures were always depicted in strict profile (148); the area of the Classic sites was totally forsaken in Postclassic times (154); Sahagún's *Historia* was a "monumental *journal*" (174, italics mine). Some of these claimed errors are not without effect on the interpretative as opposed to the factual level.

The book is attractively printed, and line drawings, mostly from sculpture, are inserted here and there as decorations. Thirty pages of photographs lack numeration for reference, and of course, are not keyed to the text, yet captions are minimal. Most of these plates provide esthetically very fine views of well-known architecture or sculpture at sites on the tourist trail, or in museums. The Bonampak murals are represented by two detail views of the version by Augustín Villagra Caleti, and three photographs by Giles Healey of the modern Lacandon Indians of the neighborhood are included. There is no visual coverage of the minor arts other than by the jade mask from the famous tomb at Palenque. The selection has been with a view to the dramatic, not aiming at the wide range of subject matter suitable for textbook as well as general public use. A bibliography of nearly 100 titles is more adequate from that point of view. A curious and important omission is Thompson's

definitive *Maya Hieroglyphic Writing: Introduction* (1950). It is no more "technical" than included titles on the same subject.

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Maya Hieroglyphic Writing: An Introduction, Second edition. J. Eric S. Thompson. University of Oklahoma Press, Norman, 1960. xxii+347 pp., frontis., 64 figs., 22 tables. $10.00.

Thompson's basic work on Maya hieroglyphic writing, which was published by the Carnegie Institution of Washington in 1950, is here reprinted in a cloth-cover edition as Volume 56 in the Civilization of the American Indian Series. In his preface to the second edition the author explains that the method of printing (offset) precluded alterations in the text made desirable by advances of knowledge during the nine years since the appearance of the first edition. These advances consist of the discovery of additional inscriptions and new analyses and interpretations. Under discoveries he mentions the finding of new texts at Palenque, Tikal, Dzibilchaltún, Kaminaljuyú, and other sites, and of a surviving 260-day almanac among the Mixe of Oaxaca. Under new research he summarizes briefly the work of Zimmermann, Barthel, Berlin, Proskouriakoff, Satterthwaite, Roys, and Knorozov. As is well known, Thompson, like Barthel, is highly skeptical of Knorozov's work. He points out that Knorozov seems to have accomplished little since his phonetic "break-through" eight years ago but has shifted his attention to the Easter Island script. The preface is concluded with a bibliography of 22 pertinent items published since 1950.

The publisher is to be congratulated for making more widely available this fundamental contribution to Maya writing and thought.

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Mexican Manuscript Painting of the Early Colonial Period: The Metropolitan Schools. Donald Robertson. Yale University Press, New Haven, 1959. xix+234 pp., 88 pls. $10.00.

In this handsomely published work an art historian undertakes to analyze a body of art heretofore studied only by archaeologists and historians. It is the first comparative analysis of the Indian codices of Mexico from any point of view other than that of content or of their utility as documentary source materials. The author traces and documents the development of the manuscript style from its native past to its ultimate decline. The history is that of an Indian artistic tradition that, in the years after the conquest, came under an increasing degree of European influence. The assimilation of European techniques and forms grew particularly strong as painters became available who had never experienced the ancient culture as adults. The persistence of the native tradition and its development into a recognizable school of colonial painting is one of the remarkable facets of 16th century Mexico.

The core of the volume is a detailed stylistic examination of approximately 30 manuscripts from the Valley of Mexico, the area to which this study is limited. Throughout, the analytical tools used are objective and explicit. Each codex is discussed with reference to the composition of the page, the treatment of space, line, color, and human and other forms. In many instances these analyses yield results that go beyond the implications of style. Chapters on the painters and their books and their place in both the Indian and Spanish worlds provide the context in which the art existed and, for a while, flourished.

The main synthetic device is the establishment and recognition of two major regional schools of manuscript painting in the Valley of Mexico. The first of these, that of Mexico-Tenochtitlán, is seen as the leading school in the quantity and quality of manuscripts produced (and preserved) and is also the focus of Spanish influences. Two stages of this school are defined. The first, about 1530–41, shows Spanish influence only in peripheral details. Four manuscripts are assigned to this stage: the Codex Borbonicus, the Tira del Museo, the Matrícula de Tributos, and the Plano en Papel de Maguey. Each of these documents uses the native frame or hieroglyphic line. The unvarying width of this type of line defines forms by outline and is quite unlike the hispanicized and later contour line, which by its varying width is able to model and create visual effects such as perspective. The indigenous treatment of space, as seen in the large panels of the Tonalamatl of the Codex Borbonicus and in the Matrícula, where the forms are evenly sifted over the page, is defined as "scattered-attribute space" and is contrasted with other spatial conventions including the European landscape space achieved in later, more acculturated manuscripts.

In his analysis of the manuscripts from the first stage of the Mexican School the author makes a number of original contributions. The most controversial will be the argument brought forward to substantiate the Colonial date for Codex Borbonicus. The reconstruction of the native prototype of the Matrícula adds much to our understanding of that document and is an example of the continual editing and revision of preconquest forms that occurred during the life of the manuscript art. The dating of the Plano (excepting its later additions and glosses), the earliest yet proposed, is important in that it shows the Plano to represent an earlier view of Tenochtitlán than previously suspected.

The second stage of the Mexican School is discussed with reference to such codices as Mendoza, Telleriano-Remensis, and Osuna. The discussion of the Codex of the Museo de América, here called Codex Tudela, and Codex Magliabecciano, also of the Mexican School, to-

gether with related sources, brings new data to bear on this complicated problem. The decline of the school is documented by the Codex Mexicanus.

The School of Texcoco is the more conservative of the two, resisting European influences accepted earlier by the metropolitan center. The earlier stage of this school is illustrated by five manuscripts including the Quinatzin and Xolotl maps. Two maps of the Relaciones Geográficas of 1579–81 are late examples of the school.

One of the interesting distinctions between the schools is the organizing principle behind the composition of the historical manuscripts. Such a manuscript as the Codex Nuttall, from the Mixtec School, is seen as event-oriented, with place and time signs as added qualifiers. In histories from the Mexican School events and places are subordinate to the linear organization of the "stream-of-time" signs. The Mapa de Tepechpan is an example of such a time-oriented manuscript. The third possibility, that of place-oriented histories, is associated with Texcoco. The Codex Telleriano-Remensis, from the second stage of the Mexican School, is seen as an unsuccessful attempt to synthesize the stream-of-time and place-oriented histories. Here the place and time signs are in unresolved conflict and the clarity of presentation is lost.

A somewhat artificial but no less important school is represented by the manuscripts produced at the Colegio de Santa Cruz in Tlatelolco. The avant-garde center of the Colonial manuscript painters, the Colegio accepted a greater degree of hispanicization than the other centers and it produced two major documents, both called forth by European patronage of the art: the Badianus de la Cruz Herbal and the map attributed to Alonso de Santa Cruz.

The separate treatment of the Sahagún manuscripts is disappointing only in its brevity. The carefully documented characterization of the Florentine Codex as a Medieval encyclopedia motivated by the outlook and learning of the Renaissance is an intriguing addition to our understanding of the great Franciscan ethnologist. The almost unique nature of the patronage of the manuscript art provided by this ambitious codex together with the complex history of its compilation perhaps explains the variety of styles found in it. These vary from an "Aztec Revival" style to one that utilizes the most advanced techniques of the Renaissance print makers.

We would question, however, the validity of using the dates in the texts of the various books of the Florentine Codex to date the accompanying illustrations. Current opinion holds that the codex was produced between 1575–77 and taken to Europe in 1580. That most of the text was written before these dates does not alter the possibility that all of the illustrations may have been drawn between 1575 and 1577, whether or not they were copied from earlier versions. As it is, Robertson accepts dates between 1566 and 1585 for the component books of the codex. The first of these terminal dates derives, unfortunately, from a misprint for 1576 in the 1946 edition of the Sahagún text, and the 1585 date comes not from the Florentine Codex but from Sahagún's later revision of his History of the Conquest, a fact not noted by the editor of the edition cited by Robertson. The implication of these remarks for Robertson's presentation of the codex is negligible but we feel that the acceptance of the textual dates prevented his analysis from reaching a fresh solution to the vexing problems of dating the codex.

The volume is an important and significant landmark in its field. It cannot be ignored by anyone interested in the pictorial manuscripts of ancient Mexico and its contributions in the fields of historiography and acculturation are no less than those to the codices as monuments of Indian art.

Finally, a word about the illustrations. Nearly all are photographs of the original manuscripts rather than of the lithograph editions and the publisher is to be congratulated for the exceptional clarity of the reproduction.

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A Stratigraphic Excavation at El Risco, Mexico. WILLIAM J. MAYER-OAKES. Proceedings of the American Philosophical Society, Vol. 103, No. 3, pp. 332–73, Philadelphia, 1959. 12 figs., 9 tables, 2 maps. $1.00.

Mayer-Oakes' report is a brief account of an exceptionally important excavation at the site of El Risco in the Valley of Mexico. El Risco is composed of a number of scattered *tlateles* or artificial islands on or near the former shore of Lake Texcoco in the Guadalupe-Tepeyac region, a short distance north of Mexico City. These *tlateles* extend for a distance of approximately 2 miles in a generally north-south direction. Mayer-Oakes' excavation was in a mound identified as El Risco II which is at or near the southern end of the site. It is several miles east of Ticomán and about the same distance northeast of Zacatenco. While occupied later than these two sites, it also appears to be a village site. This is one reason it is so important, for we have so little information on smaller sites without major architectural remains during the Classic and Postclassic periods in the Mesoamerican highlands.

Mayer-Oakes made the stratigraphic cut in a vertically exposed portion of the El Risco II mound. A rectangle 10 feet by 6 feet was excavated in arbitrary 1-foot levels to a maximum depth of 12 feet, which marked the bottom of the deposit. The report is primarily concerned with an analysis of the pottery found in this excavation, but also includes a comparative section in which some of the as yet unpublished material from George Brainerd's excavations at Portesuelo in the eastern part of the Valley of Mexico is tabulated, discussed, and compared with that from El Risco. The report concludes with an interpretative section in which the author offers certain inferences and hypotheses concerning settlement pattern, population and social structure in the

Valley of Mexico during the Classic and Postclassic periods, drawing in part on data from El Risco and Portesuelo.

The El Risco report should be read in conjunction with Paul Tolstoy's *Surface Survey of the Northern Valley of Mexico* (reviewed in *American Antiquity*, Vol. 25, No. 1, 1959) and in fact cannot be understood or used properly without it. The reason for this is that Mayer-Oakes has used for the most part the ceramic types defined by Tolstoy, referring the reader to Tolstoy's study for the actual descriptions and illustrations. The El Risco site is also notable for its heavy concentration of the red, fabric-marked ware that Tolstoy has associated with the making of salt.

Analysis of the pottery from his excavation has led Mayer-Oakes to believe that El Risco was occupied in the Classic period and continued to be occupied without interruption throughout most of the Postclassic period. He concludes from analysis of the pottery obtained in his excavation that there is no evidence of any break between the Classic and Postclassic periods at El Risco. This conclusion disagrees with those of Tolstoy and others who see a relatively sharp break between the ceramic traditions of the Classic and Postclassic periods in the Valley. This is another reason this report is of such importance. One would expect such a break at a great center such as Teotihuacán, but in outlying rural areas one would predict at least some measure of continuity, which would be reflected in the ceramic record in the form of a gradual change to the ceramic patterns of the Postclassic. Mayer-Oakes presents evidence for such a transition. Unfortunately, I do not believe that he has established the existence of a Teotihuacán or Classic period occupation at El Risco beyond any reasonable doubt. He found sherds of a type called El Risco Metallic which he describes as a local imitation of Plumbate, to within a foot of the bottom of the deposit. This as well as other evidence would suggest that the entire deposit is Postclassic in age.

Part of the problem is whether all of the deposit excavated represents gradually accumulated midden material or whether the lower part of the cut consists of one or more deposits of fill containing mixtures of Teotihuacán and later materials. Mayer-Oakes considers the latter possibility, pointing to evidence which suggests that this occurred (p. 367), but states that "the relative smoothness of type trends" argues against it. (Note his profile of the cut, p. 335.) In short it seems to me that more extensive excavations will have to be carried out at El Risco before Mayer-Oakes can prove his case. But in view of what he found in one small test pit I do not doubt that he will be able to do so.

Similar evidence should be forthcoming from Nicholson's studies of the Portesuelo materials excavated by Brainerd in 1954 and 1955 and by Nicholson in 1957. The Portesuelo deposits contain material ranging from Teotihuacán II–III to Aztec III, plus architectural remains and grave lots covering roughly the same span. The grave lots will be of particular importance in terms of the transition between the Classic and Postclassic, since Brainerd found Teotihuacán and "Coyotlatelco" whole vessels in the same graves at Portesuelo. Mayer-Oakes comments that approximately 100 whole or restorable vessels were found by Brainerd. I had an opportunity to inspect a number of these vessels with Brainerd in Mexico in 1955 and there can be no doubt that the Portesuelo occupation began at least as early as the Teotihuacán III or Xolalpan phase.

It is not possible in a short review to do justice to the many points raised by Mayer-Oakes in his interpretative section. He offers a number of stimulating hypotheses and inferences which deserve careful consideration. To cite one example, he puts forward a "social structure hypothesis" for the Valley of Mexico during the Classic period in which he distinguishes three types of settlements: the ceremonial center (Teotihuacán), the secular center (Amantla and Portesuelo), and rural loci (El Risco and others). The first of these he characterizes as an "urban" community, the second as "peasant" and the third as "folk." It is clear that there must have been major differences in community type within the Valley during the Classic, and we must try to distinguish them if we are to make any progress towards an understanding of the nature of society in the Valley during the florescence of Teotihuacán. Nevertheless, Mayer-Oakes' use of the terms "peasant" and "folk" is confusing rather than illuminating. For example, in talking about the "social units" comprising "peasant" communities he speaks of "artists, craftsmen, merchants, traders." Correspondingly he speaks of "farmers (and) laborers" in "folk" communities. More reasonable and perhaps of greater heuristic value would be a classification which attempts to order communities into city, town, and village, with the peasantry seen as residing primarily on the village level. I certainly do not see that the term "folk" has any particular meaning in this context nor that anything is gained by referring to a "secular" center presumed to be composed of craftsmen, merchants, and such, as a "peasant" community.

I also feel that Mayer-Oakes' characterization of Teotihuacán itself unduly stresses the relative absence at the site of utilitarian and simple domestic objects, although it is easy to obtain this impression from most of the published data on the ancient city. I am convinced that Teotihuacán was much more of a city both in terms of total population and in its composition than Mayer-Oakes suggests.

In sum, Mayer-Oakes' interpretative section will arouse controversy, but this is to be expected. We must be grateful that he has not confined himself to the description and interpretation of his data in a narrow sense and has ventured into areas of interpretation which few have attempted to handle. His report is a welcome one, stimulating and refreshing in scope, and represents a fundamental contribution to the archaeology of the Valley of Mexico.

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The Stony Brook Site and Its Relation to Archaic and Transitional Cultures on Long Island. WILLIAM A. RITCHIE. New York State Museum and Science Service, Bulletin 372, Albany, 1959. 169 pp., 53 pls., 7 figs., 2 tables. $1.00.

In this volume Ritchie pre[illegible] first well founded definitions of the Archaic [illegible] complexes of Long Island, New York. Ess[illegible], the work consists of detailed reports on four sites: Stony Brook, Wading River, Jamesport, and Sugar Loaf Hill.

The Archaic complex is characterized by an artifact inventory resembling most strongly that found in Laurentian sites in inland New York. There are also some projectile points suggesting an origin in the Lamoka complex. The Orient complex is best known from burial sites consisting of pits on hilltops. Stony Brook is the first habitation site definitely to be identified with it. Steatite vessels, fishtail projectile points, and crude, thick, cordmarked pottery are characteristic.

The Stony Brook site consists of a habitation area marked by two superimposed middens. The uppermost midden is attributed to the Orient culture and to a brief, later occupation by people using Sebonac pottery. The lower midden offered some evidence for an occupation attributable to the Archaic period. The Wading River site supports the identification of the lower level of Stony Brook in the presence of a somewhat similar complex devoid of Orient traits. The Jamesport and Sugar Loaf Hill sites are characterized by burial pits containing offerings of artifacts associated with human bones in the tradition of the Orient culture.

Two radiocarbon dates from the Stony Brook site, collected with the objective of dating the two principal levels, are virtually identical: 974 B.C.±250 and 944 B.C. ±250. It seems probable that both are referable to the Orient occupation because Ritchie obtained, previously, a date of 944 B.C.±250 for the Orient No. 2 site. The Sugar Loaf Hill site yielded a date of 1043 B.C.±250 and the Jamesport site a date of 763 B.C.±220. These dates indicate a time span "for the Orient complex on eastern Long Island of some 280 years, between approximately 1043 B.C. and 763 B.C." Ritchie corrrelates the ceremonialism of the Orient culture with the close of early Point Peninsula of inland New York for which, as a whole, he has three dates: 2448 B.C., 998 B.C., and 563 B.C.

Specialists in the archaeology of the Northeast will find Ritchie's monograph to be a valuable source of comparative information on a little known period in that area. He provides a firmer foundation for the beginning of the sequences I established in *The Archaeology of Coastal New York* and clarifies the relationships of the, heretofore, enigmatic Orient culture. This complex can no longer be considered as merely the mortuary expression of the North Beach focus but as an earlier culture with habitation sites assignable to it.

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Susquehannock Miscellany. Edited by JOHN WITTHOFT AND W. FRED KINSEY III. Pennsylvania Historical and Museum Commission, Harrisburg, 1959. viii+167 pp., 24 figs.

Susquehannock Miscellany is a product of the Susquehannock Symposium held May 30–31, 1958, at Franklin and Marshall College in Lancaster as the program of the annual meeting of the Society for Pennsylvania Archaeology. This book is an excellent example of the results that can be obtained by the cooperation of professional and amateur archaeologists working on problems of mutual interest. It proves again the great value of a strong and scientifically oriented state archaeological society. Included in this volume are nine papers that present new discoveries and fresh interpretations pertaining to the history and development of Susquehannock culture.

In the opening article, Alfred K. Guthe surveys current trends in the archaeology of the Northeast. He points to the fact that archaeology is a young field of scientific inquiry that is just now beginning to see the appearance of synthesis, generalizations, and summaries following a period of data collecting. In line with the background presented in Guthe's article, William A. Hunter traces the historic role of the Susquehannock Indians in their relations with the Dutch and English colonists and with other Indian groups. He points out that their trading operations and movements during the period of their destruction set the stage for subsequent developments that preceded White settlement in the Susquehanna and Upper Ohio valleys.

Turning to the archaeological evidence as manifested by the artifacts from known Susquehannock sites, John Witthoft traces the ancestry and development of the Susquehannocks. He takes issue with an early thesis that the Susquehannocks were the southern rear guard of a general migration of Iroquoian people into the Northeast from the South. Witthoft presents evidence that the Susquehannock's origin is to be found in the general Owasco-Iroquois sequence of New York, and that the movement was to the south where the Susquehannocks displaced the resident Shenk's Ferry folk who had no relationship to the Iroquoian tradition but were a branch of a southern Piedmont tradition.

W. Fred Kinsey's analysis of Susquehannock pottery types again points up the value of pottery studies in showing the history and contacts of a people. The illustration of Susquehannock pottery types and designs accompanying this paper are very useful. An interesting glimpse of a Susquehannock cemetery is presented in the report on the Ibaugh site by Witthoft, Kinsey and Charles Holzinger. The findings at the Strickler site are presented by Arthur A. Futer. In separate articles by Witthoft, H. Geiger Omwake, and Gerald B. Fenstermaker, specific details of Susquehannock culture are discussed.

The volume is a valuable and well-illustrated addition to the literature on the Indians of the eastern United States. It is regrettable that it could not have

been expanded to greater length in order to present much more of the detailed information possessed by its authors. It is a work that should be on the bookshelf of all archaeologists and historians interested in the eastern United States.

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Two Weeden Island Period Burial Mounds, Florida. William H. Sears. Contributions of the Florida State Museum, Social Sciences, No. 5, University of Florida, Gainesville, 1959. 35 pp., 7 figs., 9 pls. $0.75.

Sears reports on the excavation of two small burial mounds which he dates late in the Weeden Island cultural phase, probably between A.D. 800 and 1200. The Brown Mound, located near the mouth of the St. Johns River, seems to have had a low core mound into which a central pit had been excavated to a depth of 18 inches below the original ground surface. A thick organic stain indicated that the pit had been lined and then approximately 28 skeletons were deposited, most in extended position. Then approximately 20 more bundle burials, one cremation, and one extended burial in contact with a mass of red ochre, were placed on the core mound. Around the edges of the mound (presumably the core structure) there was a border of intentionally placed shells. The only artifacts found were in the central pit; a "cymbal-shaped copper ornament" (part of an ear spool), and a small crude stone adze.

Tests in the neighboring village site show that occupation began considerably before the date which Sears prefers to assign to this mound. As the late dating seems to be based upon the presence of eight sherds out of the total of 273 recovered from mound fill, it seems that the Hopewellian-like features of the mound deserve more consideration in judging its age.

The MacKenzie burial mound is located in the lake region of central Florida. Seventeen bundle, three flexed, and three single skull burials were placed in shallow pits or on the original surface of the ground near the center of the mound. To the east of the burials was a large deposit of broken vessels and to the west a smaller similar offering. This practice as well as the abundantly represented pottery types clearly date the mound as Late Weeden Island or St. John's II.

There seems to be little doubt that both these mounds resulted from the emptying of charnal houses, and the better articulated skeletons are probably the better preserved desiccated bodies. Some class distinction among these people was probable, judging from early historical accounts, but it seems dubious that it can be deduced from what appears to be primary or secondary burial.

Unfortunately, this paper is not quite up to Sears' usual standard. A less schematic map and a profile diagram for the Brown Mound would have made its constructional features somewhat clearer. The profile given in an earlier paper is not clear. Imprecisely worded sentences and typographical errors are not important, but should have been eliminated by more careful editing.

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Spring Lake Archaeology: The Sorg Site. Elden Johnson. Science Bulletin, No. 3, Part 3, The Science Museum of the St. Paul Institute, St. Paul, 1959. iii+28 pp., 1 fig., 13 pls., 2 tables, 2 maps. $1.00.

Spring Lake Archaeology: The Vegetation of the Spring Lake Area. Gilbert A. Leisman. Science Bulletin, No. 3, Part 4, The Science Museum of the St. Paul Institute, St Paul, 1959. iv+13 pp., 2 pls., 4 maps. $1.00.

The Spring Lake Archaeology series is an admirable example of the type of publication which can be produced by the small museum or research group with limited resources. The projected aim of the series is a presentation of the prehistoric culture sequence in the Spring Lake area of the Mississippi Valley, a few miles southeast of St. Paul, Minnesota. The field work has assumed the nature of a salvage project since the rising waters of the Mississippi, restricted by Hastings Dam, are destroying most of the sites bordering the river in this area.

Johnson's contribution presents the results of collection and excavation at the Sorg site conducted during portions of three years 1954–56. A fairly complete account of artifacts encountered and their depositional situation is accompanied by a description of two new foci based on this material. The Sorg focus, to which most of the material recovered has been assigned, is placed in a Middle Woodland Hopewell context and is distinguished from the Howard Lake focus by the absence in the latter assemblage of Sorg Banded Dentate pottery and several projectile point forms. Johnson also sees Sorg focus relationships in the Hopewell ceramic traditions of northern and central Illinois and Wisconsin. The absence of Mississippian sherds in the Nininger focus material from the Sorg site is the chief basis for distinguishing this cultural unit from the complex represented at the Late Woodland Hahn and Horicon sites in Wisconsin. A single plain shell-tempered sherd was recovered from the eroded beach deposits at the edge of the site, but is not included in the Nininger assemblage. This is difficult to understand, since a perforated shell hoe from the same deposit is assigned to the Sorg focus. Inasmuch as the Nininger focus is described on the basis of a sample of about 70 sherds its existence must remain in doubt until further evidence is available.

Leisman's work presents a comprehensive survey of the major forms of plant life in the Spring Lake area at the present time. An extremely interesting contrast is

afforded by the inclusion of an 1855 survey of forest types in the same area. The dramatic change in vegetation which has taken place since that time will interest anyone concerned with problems of cultural-ecological relationships in the northern Midwest. An appended list of plants of known aboriginal use now found around Spring Lake indicates the depth to which the botanical environment might have been utilized in the prehistoric period.

The Science Museum of the St. Paul Institute and the Hill Family Foundation are to be complimented on adding these interesting reports to our meagre knowledge of the aboriginal cultures of the northern Mississippi Valley.

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Illinois Archaeology. Edited by ELAINE A. BLUHM. Illinois Archaeological Survey, Bulletin No. 1, University of Illinois, Urbana, 1959. ix+61 pp., 13 figs., 1 chart, 2 maps. $1.00.

As the title indicates and the limited size dictates, this publication is a condensed story of the Indian in Illinois from paleo-Indian times to the departure of the last Algonquins for points west. Since this is the first of a promised series, it is fitting and proper that such a broad background be laid.

Seven chapters cover the several time periods and cultural assemblages dominating each of the periods. These were prepared by individuals best suited to the task through experience, for each has devoted a goodly portion of his professional career to the culture or cultures involved. Howard Winters presents the paleo-Indian and the Archaic. Early, Middle and Late Woodland are covered respectively by Melvin Fowler, John Mc.Gregor, and Moreau Maxwell. Joseph Caldwell handles the complex period called Mississippian, and the end of prehistory and beginning of history, in the literate sense, is covered by J Joe Bauxer.

Mc.Gregor, as President of the Illinois Archaeological Survey, contributes a foreword in which he cites the need for the survey to serve as a central clearing house and repository for data pertaining to our prehistoric heritage. He promises future publications similar to this one, but of a less generalized order. The series will add greatly to the growing corpus of literature on the prehistory of the Mississippi Valley.

All of the material was capably drawn together by Elaine Bluhm as editor. She wisely refrained from compromising obvious differences of opinion and points to the fact that "there is often room for more than one interpretation," to which I add an "amen." She introduces this bulletin with an expansion of the theme set by Mc.Gregor and gives a bit of background history of archaeology in Illinois. On the "professional" level she rightly starts with 1921 and Warren K. Moorehead, but I wish that she had mentioned the rather good work done in the 1890's by J. F. Snyder in Brown County, Illinois, and by William Baker Nickerson in Jo Daviess County at about the same time. It would depend upon definition of the term "scientific archaeology" whether these two men, and there were perhaps others, did not actually anticipate Moorehead by two or three decades.

The author of each chapter has developed a feeling for the importance of environment upon cultural growth, or restraint, and works some "life" into the material traits with which he normally deals. This theme is carried out in the line drawings depicting for each of the periods items of importance and Indians carrying on typical activities. These drawings were effectively executed by Nancy Engle.

To the archaeologist who will use this bulletin the chapter on the historical period will perhaps be disappointing. This will come as a result of the inherent weakness of the source material with which the ethnohistorian must work and does not at all reflect upon the author. Discussion of the historical dwelling places of the several tribes must inevitably be marred at least for the archaeologist, by descriptive terms such as "probably"; "near"; "a few miles up, or down" some river, "below and/or above the mouth of the Illinois River." This usually is about as exact as the ethnohistorian can come to locating a historical village but it lacks the preciseness necessary for application of the "historical approach to prehistory." The maps for this section were capably drawn by Philip Young.

This bulletin should be very useful to those in Illinois, and even in bordering states, who must supply an eager adult public, as well as school children, with understandable reading matter on the Indian of prehistory.

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Indians of the High Plains. From the Prehistoric Period to the Coming of Europeans. GEORGE E. HYDE. University of Oklahoma Press, Norman, 1959. xiii+233 pp., 14 pls., 3 maps. $4.00.

The purpose of this book, according to the author's preface, is to present a "coherent picture of the Indians of the western high plains from the earliest times of which we have record down to the beginning of the modern period, after the year 1800 . . . [It] . . . explores the whole of the high plains area, dealing with many tribes. . . ." Actually, the problem is much more circumscribed in time, for Hyde devotes only a little more than a page to the peoples of the Plains before 1500, "when real history begins in the southern plains."

Essentially, then, this is Hyde's story of the High Plains Indians after 1500 — specifically, of the Plains Apache who dominated the southern plains from about 1500 to 1700, and of the Comanches and Shoshone (Snakes) who overran much of the central and northern plains during the 18th century. The basic data come largely from historical documents, with which are

interwoven the relevant archaeological findings since 1930 in portions of the area involved. Most of the plates have little or no direct connection with the text; but they include two highly interesting mid-18th century deerskin paintings that apparently relate to the contemporary Plains Indians.

In Hyde's view, "sometime around the date 1200 strong groups of Athapascan Indians left their old lands in the Mackenzie Basin or in the mountains to the west," and moved southward. One group of tribes followed a route west of the Rockies, and another traveled through the Plains east of the mountains. In the Wyoming region, perhaps, the Navajos split off from the eastern branch and continued southward, possibly touching at Promontory Point. The other ancestral Apaches moved down the High Plains corridor to their historic habitat, where Hyde's story really begins. What follows makes interesting, if often difficult, reading; and it should at least raise a few questions in the minds of those otherwise well-informed professional anthropologists who, as recently as 1954, still doubted that the Apache or Northern Shoshone were ever "Plains tribes in the fullest sense."

The book, resting as it does on the wide reading and reflections of one steeped in a lifetime of devotion to Plains Indian history, is not to be lightly dismissed because of its sadly inadequate documentation, its needlessly contentious manner, and its sometimes dubious logic. It represents the first comprehensive attempt at a synthesis of the Indian history of a large and important geographic area; and it is doubtful whether any other student could have done as well on an over-all basis. Viewed in conjunction with other more scholarly and better documented studies, such as those of Secoy on changing military patterns and of Thomas on early Spanish contacts with the Plains Indians, Hyde's book gives a vivid picture of the native cultures of a vast region which others have approached either on a narrower front or not at all. So far as he utilizes documentary materials, the author has come up with a plausible story, though it may be a long time before we can be sure that it is also an accurate and correct one.

There are pitfalls in Hyde's book that must be kept in mind by the reader. One is his penchant for suggesting a tentative identification or explanation where direct documentation is lacking, and for subsequently handling the suggestions as established facts. Sometimes even the original identification is not adequately qualified. On page 131, for example, Hyde observes of the "quaint names" given to certain groups by La Verendrye that "it is impossible to identify them accurately; but still we have in this report a most interesting picture of Indians — Kiowas, Arikaras, and others — in the Black Hills region. . . ."

Since many of the documents with which Hyde deals are decidedly sketchy and use tribal names not readily identifiable with the better documented groups of later times, other interpretations than his are still possible and will have to be considered by future workers. I strongly question, for example, his identification of the Canceres, living in the Sierra Blanca of southeastern Colorado in 1720, with the Kansa, at that time clearly residing on the Missouri River in northeastern Kansas, 500 miles away. His discussion of the Jumano problem is misleading and outdated, and takes no cognizance of the paper by Scholes and Mera (1940).

Hyde's book is particularly weak where it draws on archaeological evidence. He lacks any real comprehension of the aims, methods, or problems of archaeology. His ineptness in this respect is repeatedly manifested in unsupported assertions and improper conclusions whose dubious nature as evidence is not at all concealed by the bluster (for example, p. 14, n. 15; p. 37, n. 5) about the dogmatism of the archaeologists. One would like to know his authority for such statements as the following:

> The Dismal River pottery . . . seems to show many Pawnee traits, but it has some Mandan and other upper Missouri traits. . . (p. 8, n. 7).
>
> Archeologists date this withdrawal [of Upper Republican people] from Republican River about 1517. . . (p. 23).
>
> . . . a very large proportion of the pottery found [by E. B. Renaud on the Colorado plains] is of identifiable Padouca or Apache types. . . (p. 37, n. 5).

Hyde doubts, as is his prerogative, that the flat-bottomed pottery in the Yellowstone Valley is Shoshone, as has been suggested by "some archaeologists," because it is "the general opinion of authorities that the Snakes did not make pottery." Apparently ignorant of Lewis and Clark's observation that some of the Shoshone, at least, had earthen pots, and of Lowie's statement that the Northern Shoshone formerly made pottery, Hyde suggests instead that the flat-bottomed ware was perhaps Arapaho or Atsena; but he cites no authority for attributing pottery-making to either of these tribes. It is possible, I suppose, that Hyde is here using "his inborn ability to take a simple set of facts and draw deductions from them," a right which he asserts (p. 37 note) the archaeologists and anthropologists deny to anyone outside their ranks; or perhaps he is avoiding the archaeologists' error of "theorizing over the finds in a few ruined Indian villages" (p. 24). In any case, neither this item nor the "solid" evidence he cites in another connection on page 169, inspire much confidence in the critical reader; and one hopes the author's other deductions rest on more substantial evidence than do these points.

It is the author's claim that the Apache were the first people, "historically identified," to seriously attempt village settlement and cultivation in the high plains. So qualified, the statement may be true; but somehow I miss its significance. It has not yet been demonstrated, for one thing, that all or even most of the westerly sites attributed to the Dismal River culture were actually those of agricultural groups; and we cannot say unequivocally that the Apache were growing crops any farther west than were some of the Upper Republican groups of several centuries earlier — groups whom Hyde does not hesitate to identify as Pawnee. Only further research and publication, not *ex cathedra* pronouncements, will clarify this problem.

Hyde's book unquestionably falls short of the standards of scholarship achieved by many other studies, in-

cluding some by the same author, in the "Civilization of the American Indian Series," of which this is the 54th volume. It is probable, too, that the unwary non-specialist will be led astray from time to time. The scholar will deplore the dearth of references; if he can overcome his frustrations on this score, and also, if he is an archaeologist, his resentment at the gratuitous observations about his alleged derelictions and those of his colleagues, he will find here a stimulating and worthwhile addition to the literature on the western plains Indians.

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The Glen Canyon Archeological Survey. DON D. FOWLER, JAMES H. GUNNERSON, JESSE D. JENNINGS, ROBERT H. LISTER, DEE ANN SUHM, AND TED WELLER. University of Utah Anthropological Papers, No. 39 (Glen Canyon Series No. 6), Salt Lake City, 1959. Two parts, xvi + 707 pp., 176 figs., 27 tables, 1 appendix. $5.00 set, $3.00 each part.

Jennings aptly characterizes in his foreword both the contents of this report and the approach manifest in it: ". . . a conscientious record of sites and their contents is presented because many of these sites will soon disappear and this information, however scanty, comprises the only record there can ever be" (p. iv). This is basically a careful, factual record of the surface archaeology of the vast area to be inundated by waters impounded by the Glen Canyon Dam of the Colorado River. The survey effort was intensive, even exhaustive, and this resultant compilation of raw data will find continued use for many purposes. It is, in fact, this massive recording of raw data which sets this report apart from the vast majority and, in my opinion, makes it one of the most useful studies to appear in the Southwestern field in many years.

All of the above is not to say that generalizations and theoretical, problem-oriented archaeology, are absent from the report. Lister's survey of the Water Pocket Fold is an example of testing a hypothesis by survey methods, and certain problems raised by the survey, are, at least in part, solved by the survey. Nevertheless, the sites and their contents remain the basic part of the Glen Canyon archaeological survey.

The report is divided into a number of separate and largely distinct papers, each covering a segment of the whole survey through 1958, or various other aspects of the project.

Jennings, Director of the Glen Canyon Project, has written three sections of the current report. His foreword presents a brief background to the report and lists the persons who have participated in the project. His second contribution, "Introductory History," tells of the development of salvage archaeology in general, and of the Glen Canyon project specifically. His discussion of the project design, its guiding assumptions and controls, its mechanics, and its objectives may well serve as a model for future projects. The balance between research and administrative requirements is neatly pointed, and the project's insistence upon prompt reporting will strike a responsive chord in those who remember well the mass of buried data resulting from the WPA archaeology of the 30's. His third paper, an "operational manual" of field and laboratory techniques, outlines in detail the procedures used by the project. This competent, well thought-out manual will find use beyond the confines of this project.

While each survey paper presents in some detail observations and tentative conclusions based on finds in its own area, a few generalizations for the whole area are presented early in the report under the title "Findings." In brief, some of these are that approximately half of the more than 800 sites contained some form of architecture: dwellings of adobe and dry laid masonry, slab lined structures and hogans, and storage structures. Campsites, chipping areas, and pictograph and petroglyph locations comprise the remainder of the sites. Most of the architectural remains occur on the Kaiparowits Plateau and in the San Juan–Colorado Triangle. The remainder of the area contains both permanent and temporary settlements or temporary sites only. A variety of lithic artifacts was found, but few generalizations could be made. Kayenta-derived pottery is general throughout the Glen Canyon area. Mesa Verde pottery is largely restricted to the Triangle south and east of the Colorado. Other ceramic influence, primarily on the right bank of the Colorado, is noted from southwest and west central Utah and from the Fremont area. Most ceramic remains indicate occupation of the area during Pueblo II–III.

Five of the six survey papers deal wholly or in part with the right bank of the Colorado, and the tributaries and uplands adjacent to it. "The Glen Canyon Right Bank Survey" by Lister shows occupation concentrated in the few major, well-watered tributaries. Elsewhere only limited usage was made of the area. Travel was difficult and the environment did not invite intensive occupation.

Suhm's "Extended Survey of the Right Bank of the Glen Canyon" presents the results of extensive rather than intensive sampling of the sites mostly in the headwater area of the right bank tributaries. Chipping areas and campsites were most common in this area while only 16 of 174 sites contained architectural remains. Somewhat more than half the campsites contained pottery, mostly gray wares.

Lister's survey of "The Water Pocket Fold" was undertaken to test the hypothesis that the relatively well-watered valleys leading from the Colorado to the Fremont and other areas served as corridors through the otherwise generally impassible country. Fifty-three sites were recorded. Even though Fremont sherds predominated throughout the area, an increasing percentage of Kayenta sherds from north to south would seem to support the corridor idea.

The "Archeological Survey of the Kaiparowits Plateau" by Gunnerson produced a total of 194 sites that showed evidence of masonry structures. Ecologically the most favored segment of the entire area, the Kaiparowits was probably the hub from which many of the temporary camps and dwellings elsewhere were exploited. The vast majority of the pottery is referable to the Kayenta branch.

Fowler's "Main Stem Survey" suggests that the river served primarily as a means of travel and a source of chipping materials, even though a few more permanent habitations were also found.

The final paper, "San Juan Triangle Survey" by Ted Weller, shows part of the area to have been more or less intensively occupied from Basketmaker III through Pueblo III. Mesa Verde influence was stronger here than elsewhere, but in the western part Kayenta influence appeared to be dominant.

Each of the survey papers is accompanied by a map and a table listing and describing the sites surveyed. Photographs and other figures are well reproduced. Ceramic typology, primarily the work of Florence C. Lister, is consistent, but lithic typology is in spots inconsistent. A general table of contents would have improved the report. This is a monumental report in more than the sense of sheer bulk. It marks a significant achievement made under trying conditions, and should have a useful place in the literature of the Southwest.

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Early Man in Washington. Richard D. Daugherty. Department of Conservation, Information Circular No. 32, Olympia, 1959. 65 pp., 28 figs. $0.50.

This attractive booklet, intended for the general reader, presents the results of investigations at the important Lind Coulee site in central Washington. Essentially the same findings and conclusions were published previously in a technical report, which was ably reviewed by Luther S. Cressman in an earlier issue of this journal (Vol. 23, p. 204). In passing on these discoveries to the general public without too much delay and in a manner which is interesting and simple without being condescending, Daugherty sets an example that may well be emulated by other workers.

After summarizing the geological background and the culture history of western North America, the author proceeds to use the Lind Coulee project as an object lesson on how the archaeologist works in the field and in the laboratory. He shows how archaeological sites are located, how excavations are carried out, how the findings are recorded, and, finally, how the stone and bone implements, the food remains, and other types of evidence recovered during the investigations are used to reconstruct the way of life of the hunters who roamed the Northwest many thousands of years ago. The account concludes with a study of cultural relationships.

The booklet will demonstrate to the general reader that the successful completion of a modern archaeological project and the analysis and publication of what was discovered can be accomplished only through the close co-operation of many individuals, including specialists in a number of different fields.

The editing was done with considerable care, yet there is one omission. A publication by Swanson which is cited on p. 55 was not included in the bibliography. The value of the work is enhanced by numerous excellent illustrations and an appendix with reproductions of field forms typical of those in common use.

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Ancient Population of Siberia and Its Cultures. A. P. Okladnikov. Russian Translation Series of the Peabody Museum, Harvard University, Vol. 1, No. 1, Cambridge, 1959, vii+96 pp., 24 pls., 3 maps. $3.50.

This paper appeared originally in Russian as an introductory article in a monumental ethnographic compendium entitled "The Peoples of Siberia," published in 1956 by the Institute of Ethnography of the Academy of Sciences of the U.S.S.R. This kind of undertaking has had a certain vogue in Russia over the past decade. It has served well as a vehicle for badly-needed syntheses by regional specialists. At the same time, it has frequently suffered from the kind of writing which is neither popular nor truly technical in style or content. The present report is true to type in this respect, and fails to focus sharply on current frontiers of research in a manner fully satisfying to the specialist. Yet it is certainly a convenient summary of recent knowledge and, given an adequate translation into English, would be useful, for example, in teaching.

A significant part of the original work and original primary sources on which this report is based are by Okladnikov himself. We may thus expect, in addition to a survey of previously available facts, at least a few original statements which only the author is in a position to make. These do occur, and we can only regret that the format and style of the paper cause them to be couched in somewhat mysterious form.

Thus, we are reminded of the Irkutsk Hospital site, of Paleolithic date, which the author feels may be earlier in date than Mal'ta or Buret'. The opinion is an exciting one, since the materials would then be the only genuinely ancient parallels to the European Solutrean in Siberia. However, the artifacts were excavated in 1871 and lost in 1879, and we are not told what considerations have influenced the author in his cursory re-evaluation of this generally neglected find.

Farther on, Okladnikov enlarges the already rather extensive corpus of his enigmatic statements on Lena Neolithic chronology. He omits Bestyakh and Turukta from this particular summary, and fails to differentiate, in passing, between the dates of Yuedey and pre-Bronze Kullaty. At the same time, he apparently views Malaya Munku as later than Kullaty, though he has equated the two sites in time elsewhere. This revision of their mutual placement is interesting, since Malaya Munku does have a fair amount of check-stamping (a late feature), while the properly Neolithic Kullaty materials seem to have little, if any, check-stamping.

New tidbits of information on the Amur and Maritime regions are welcome in view of the scantiness of data on the area. Work at Osinovka, north of Vladivostok, in 1953 revealed a pre-Neolithic complex within the Far Eastern pebble-tool tradition. Work at the same site in 1955 dealt with the early Neolithic occupation, similar to that of the earlier level at Tetyukhe. We are given some details on these and later complexes, which Russians often consider relevant to the origin of many features of maritime Eskimo culture.

The treatment of later events on the Chinese periphery is largely founded on the work of others. The English version benefits from consultation with Hsu Cho-yun, of the Department of Oriental Languages and Literature at the University of Chicago, who corrects two misinterpretations of Chinese documents by Russian archaeologists (footnotes 2 and 4, p. 66).

Unfortunately, the English translation itself is unspeakably bad. Tortured sentence structure results from inept handling of the simplest problems of word order. The choice of words is generally unidiomatic in the extreme. A number of Russian words are left inexplicably untranslated, such as kurgan (mound), zavod (factory), pisanitsa (petroglyph). Russian proper names are consistently mangled, for example, Turbinsk for Turbino, Shishkin for Shishkino, Chukot for Chukchi, Yolba or Wolba for Uolba. Common Chinese and Japanese names were not recognized in their Russian transliteration, and we find Hwang Ho (Yellow River) given as Khuankhe, and Yayoi as Iaei. Luckily, most of the Chinese proper names were checked later by H .G. Creel.

Far more serious, however, are errors in the translation of terms referring to artifacts and techniques. These errors occur approximately at the rate of one per page, and make the English translation more or less unusable as a source of specific information. Thus, we have "miscellaneous implements" for small implements, "pin" for awl and for rod, "knife-like plates" for lamellar flakes, "cutter" for chopper and sometimes for burin, "attachment" for point, "pectinate" for dentate, "dugout" for pit house, "handle" for butt (of ax), "burin" for hammerstone, "grinding" for retouching, "embossing" and "chiseling" for pecking, "groove" for pit, "complicated bow" for compound bow. We are told that Suchu Lake yields "sharp-pointed heads finished on the edges" and that, among the Mo-hê of the Chinese annals, "vodka was made of rice." In fact, the present review would have been quite impossible without reference to the original, since the English translation makes it difficult indeed to determine just what the Russians have been finding in Siberia.

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Anthropology in the South Seas: Essays Presented to H. D. Skinner. Edited by J. D. FREEMAN AND W. R. GEDDES. Thomas Avery and Sons, New Plymouth, New Zealand, 1959. 267 pp., frontis., 87 figs., 31 pls., 10 tables, 3 maps. (N.Z.) £2 2s.

This volume contains 11 essays written by former students and associates of H. D. Skinner, a pioneer in anthropological research, museology, and teaching in New Zealand. The three articles on archaeology are especially appropriate, since Skinner laid the foundations for systematic archaeology in New Zealand. His approach was based on the study of classical archaeology in England and on experience in the United States gained from participating in field work in Ohio with Shetrone, at Pecos with Kidder, in the Mimbres area with the Cosgroves, and at Pueblo Bonito with Judd.

In the first essay Jack Golson proposes a classificatory scheme for New Zealand prehistory. "Such a scheme involves the use of fundamental operational and interpretative concepts rooted in the nature of archaeological evidence itself, whereby the same types and collection of types are employed for purposes of cultural classification, chronological description and functional interpretation" (p. 29). In his thinking Golson relies heavily on Childe (1956) and Willey and Phillips (1958). The problems of correlation of archaeological units cause the author to define and discuss such terms as culture, phase, sequence, period, aspect, and component. He demonstrates the scheme through the use of data pertaining to the Archaic and Classic Maori phases of New Zealand Eastern Polynesian culture.

In a shorter essay Leslie Lockerbie summarizes the culture sequence in southern New Zealand. Included are a discussion of the stratigraphic evidence and site and cultural inventories of the major phases. The article is concluded with a list of 24 pertinent radiocarbon dates run by the Nuclear Sciences Laboratory in Wellington.

The least geographically parochial of the three archaeological essays is by Roger Duff and deals with Neolithic adzes of Eastern Polynesia. The purpose of his essay is to "introduce a study of the regional distribution of defined adze types within Polynesia and to consider whether the distribution suggests any demonstrable succession in their development and diffusion" (p. 122). The most serious implications of this type of analysis have to do

with migration in the Pacific. Duff's comparisons of adz types follow those of Heine-Geldern (1932, 1945) and Beyer (1948) and extend to the Asiatic and North American continents. He notes that ". . . nothing equivalent to the Polynesian–Indonesian–South Chinese tanged adze has been recorded from the North American continent. . . . Plotted on a map the American records are seen to be a continuous extension of the North Asiatic grooved adze, following the North Pacific littoral, while the Polynesian forms clearly suggest a trans-Pacific extension of the South Chinese–Indonesian stepped adze. . . ." (p. 122). Duff extends his earlier attempts (Duff 1950, 1956) in this essay and presents an amended typological classification into which most Polynesian adzes may be grouped.

Heyerdahl's theory of an American origin of Polynesian culture finds no support in Duff's typological analysis. As for Sharp's (1956) "theory of drift within Polynesia with its implication of a chaotic pattern of culture traits," Duff draws attention to the clear-cut distinction between Western and Eastern Polynesian adz types. In Eastern Polynesia Duff finds radial diffusion to be the case and lends support to traditional theories of cultural centers such as the Society Islands.

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NOTES AND NEWS

EDITED BY NATHALIE F. S. WOODBURY

NATIONAL SCIENCE FOUNDATION GRANTS

Albert C. Spaulding, Program Director for Anthropology, National Science Foundation, reports the following 1960 grants for archaeological work made from the Office of Social Sciences. Out of 16 grants made in the anthropological sciences, ten are in the sub-field of archaeology, and eight of these pertain to New World prehistory.

The topics of research, grantees, and grants are: Late Prehistory of Northern Arizona (Marvin A. Stokes, University of Arizona), one year, $9500; Urbanization of Teotihuacán (René Millon, University of California, Berkeley), two years, $9800; Interpretations of Peruvian Archaeology (John H. Rowe, University of California, Berkeley), one year, $9900; Analysis of Excavations in Peru (William Duncan Strong, Columbia University), one year, $2800; Upper Palaeolithic Cultures in the Dordogne (Hallam L. Movius, Harvard University), two years, $35,000; Archaeological Research in the Caribbean (William G. Haag, Louisiana State University), one year, $13,000; Ecological Adaptations in the Later Stone Age (W. C. Gabel, Northwestern University), two years, $21,900; Archaeology of Tikal (Alfred Kidder, II, University of Pennsylvania), one year, $23,000; Prehistoric Studies of Lubbock Reservoir (F. E. Green, Texas Technological College), one year, $6000; Development of Pre-Columbian Culture (Robert Wauchope and E. Wyllys Andrews, Tulane University), three years, $40,700.

HANDBOOK OF MIDDLE AMERICAN INDIANS

The *Handbook of Middle American Indians* will consist of 11 volumes, the titles and editors of which are:

1. Introduction — Robert Wauchope
2. Natural Environment — Robert C. West
3. Archaeology and Ethnohistory of Southern Mesoamerica — Gordon R. Willey
4. Archaeology and Ethnohistory of Northern Mesoamerica — Gordon F. Ekholm
5. Frontiers of Mesoamerica and External Relationships — Willey and Ekholm
6. Guide to Sources and Materials for Ethnohistory: General and Chronological Materials — Howard F. Cline, Charles Gibson, and H. B. Nicholson
7. Guide to Sources and Materials for Ethnohistory: Regional and Topical Bibliographies — Cline, Gibson, and Nicholson
8. Ethnology — Evon Z. Vogt
9. Social Anthropology — Manning Nash
10. Physical Anthropology — T. Dale Stewart
11. Language and Linguistics — Norman A. McQuown

Early in the planning stage, the Editorial Advisory Board met in New York for two days and outlined the contents of each volume. Later, conferences were held by selected members of the Advisory Board to revise and perfect the outlines of related volumes. One such meeting was held in Washington and another took place in Berkeley. The general editor consulted with individual editors as opportunity offered. Some idea of the considerable amount of correspondence that has been necessary is indicated by the fact that more than 300 letters have been exchanged between the volume editors and the general editor's office at Tulane.

To date about 238 articles have been solicited from leading authorities. Acceptances have been received from 184 authors. Thirty-seven requests are pending and 17 were declined, almost invariably because of already existing heavy commitments. We have sent follow-up letters in most of the pending cases. When the articles were originally solicited, the volume editor's suggestions regarding content and scope were transmitted to each author, and the place of the article in the broader sections of the volume was explained. We have recently mailed to each contributor copies of the volume outlines, and the associate editor's general instructions to authors.

The associate editor, Mrs. Margaret A. L. Harrison, is building a master bibliography and, together with the general editor, is planning format. We have been in touch with several publishers, but final arrangements can be made only when we can more accurately estimate the number of illustrations and other specifications. The National Science Foundation is financing the assembling of the articles, but no further assistance has been received. The general editor and two members of the Advisory Board have been discussing possible support with another foundation which has expressed considerable interest, but which must wait until we can actually submit a collection of manuscripts before even considering the awarding of a grant. Substantial additional funds will be necessary to complete the *Handbook* and see it through publication.

ROBERT WAUCHOPE, General Editor
Handbook of Middle American Indians
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FELLOWSHIPS FOR FIELD WORK IN YUCATAN

Tulane University offers three graduate fellowships for men and women for archaeological field work for the season, November 1, 1960, through May, 1961, at the Maya ruin, Dzibilchaltún, Yucatán, 12 miles north of Mérida. The fellowships pay round trip air passage from

New Orleans plus 1000 pesos per month. Students will live in Mérida.

Duties are to supervise excavation units of the Tulane–National Geographic Society project under direction of E. Wyllys Andrews, Field Archaeologist in Charge, and Associate in Archaeology of the Middle American Research Institute, Tulane. Work in the laboratory will be expected after completion of the field day.

Qualifications are an A.B. degree in anthropology or standing as a graduate student in anthropology, with field experience in excavation, plan making, note taking, and description of artifacts. Health, of course, must be excellent. Fellowship holders will be expected to register for graduate study in anthropology at Tulane University for the period of the work.

Application, with supporting letters, should be made promptly to Robert Wauchope, Middle American Research Institute, Tulane University, New Orleans, La.

ASSOCIATION FOR LATIN AMERICAN STUDIES

A national organization to coordinate the interests and efforts of diverse groups interested in Latin America and to effect communication among scholars concerned with the area was established August 29, 1959, at the Sagamore Conference. This conference, organized for the purpose, was attended by 27 academic scholars and one representative each of the American Council of Learned Societies, the Social Science Research Council, the National Research Council, the Pan American Union, the Hispanic Foundation, the Rockefeller Foundation, and the Creole Foundation.

The purpose of the organization is to promote Latin American studies in all fields and cooperate with other scholarly agencies. The Association is made up of individual and institutional members with a council of fifteen as governing body. Robert Wauchope, The Tulane University, represents anthropology among the executive officers on the council.

The official organ of the association is *ALAS*, a quarterly bulletin which solicits information on all activities in the Latin American field.

Membership in the Association is $3.00 (individual), $1.00 (student), and $25.00 (institutional). Checks for membership should be sent to Harvey L. Johnson, Indiana University, Box 70, Indiana. Items for *ALAS* should go to Box 3768, University Station, Gainesville, Florida.

CALIFORNIA

The Department of Water Resources is planning a vast program of water conservation and use throughout California. The program calls for the construction of a number of dams, for the filling of many reservoirs, and the construction of many miles of canals. In a most commendable and far-sighted move they provided funds for an archaeologist to investigate the historic and archaeological resources within those areas.

On January 1, 1960, Francis A. Riddell, Director of the State Indian Museum, Sacramento, became a member of the History Section of the State Division of Beaches and Parks as Archeologist. Under the title he will implement a contract between Beaches and Parks and the State Department of Water Resources concerning archaeological survey and salvage in the numerous project areas of that Department. William H. Olsen, formerly curator of the Columbia Historical State Park Museum, Tuolumne County, has replaced Riddell as Director of the State Indian Museum in Sacramento.

Assembled by Francis A. Riddell

HIGHLAND SOUTH AMERICA

Ecuador. In the April issue of this journal, Robert E. Bell reported on a collection from an Early Man site in Ecuador made by Allan Graffham, a geologist of Ardmore, Oklahoma. This site was further explored between January 23 and February 7 by Bell and by William J. Mayer-Oakes, representing the Museum of the University of Oklahoma. The site, called "El Inga," is an open one on a badly eroded hillslope flanking Cerro Ilalo, near Tumbaco, about 10 km. east of Quito. The evidence of early occupation comes from a layer of dark soil 30 to 40 cm. deep which comprises the soil mantle in the uneroded parts of the site. The Oklahoma party made two test excavations in this deposit. The collection, including excavated and surface materials, comprises around 100,000 obsidian pieces and 5000 specimens of basalt. The obsidian work includes several varieties of projectile points, large side and end scrapers, ovate bifaces, gravers, drills, prismatic blades, and microblades. The commonest type of projectile point has a big fish-tail stem and is strikingly similar in shape to the commonest type of point from the first level of occupation at Fell's Cave on the Straits of Magellan. Some fragments of bases resemble the bases of Clovis points. Both these styles are characterized by basal and edge grinding and have irregular channel flakes removed from either one or both faces. Basalt artifacts include scrapers, choppers, pulping planes, manos, and utilized flakes.

Peru. The Instituto de Etnologia y Arqueologia, University of San Marcos, Lima, organized an archaeological conference which met November 9 to 14, 1959. The proceedings of this conference (the "Semana de Arqueología") are scheduled for publication by the University.

Dorothy Menzel, who attended the conference, reports that a number of papers dealt with recent discoveries. Augusto Cardich discussed his 1959 work at the caves of Lauricocha, following up the studies on which he published a report the previous year. The caves of Lauricocha are situated at an elevation of about 13,000 feet at the headwaters of the Marañón River, Department of Huánuco, and they contain deep stratified deposits. Cardich reported a radiocarbon date of 7,566 B.C. ± 250 for the lowest level of Cave N–2. This date was obtained by Isotopes, Inc., on a sample of charcoal and burnt bone.

Cardich found a burial, with the skeleton more or less preserved, in the earliest deposit of one of the caves, but he decided not to remove it until he could get the help of specialists. Two more burials were found in later preceramic levels, and these burials were excavated. In October, 1959, Jorge C. Muelle visited the site, accompanied by Ramiro Matos and Duccio Bonavía.

Frédéric Engel read a report on the discovery of a new preceramic cemetery on the Paracas Peninsula for which he has a radiocarbon date of 3060 B.C. (details not available). The bodies are extended and wrapped in skin clothing and twined bast textiles. There is no cotton. The burials are in clean sand with no grave structure. Other finds include bone needles, a shell necklace, gourds painted all over in red or purple, chipped stone points, some with stems, and other goods. Food accompanying the dead consisted of roots of *caña brava*, both in the intestinal tract and in bags near the mouth of the dead.

There has been much other recent work which was not reported at the conference. Jorge C. Muelle, Director of the Museo Nacional de Antropología y Arqueología, directed new excavations at Ancón in May, 1959. The area explored is a northern extension of the famous Tank site lying below the road to Las Colinas. Part of the area is now used as a soccer field. The excavation was supervised in the field by Federico Kauffmann and Fidel Untiveros of the Museum staff. Thirty-nine test pits were dug. Under about 30 cm. of windblown sand was a layer of preceramic refuse up to a meter in thickness. Intrusive into this refuse are Early Ancón burials, some with pottery associated. The pottery is Curayacu 1 or 2 in Lanning's classification — that is, before the arrival of Chavín influence on this part of the coast.

Muelle has also identified an important new Early Ancón site on the Hacienda Garagay between the Lima and Chillón valleys. He explored the place in September, 1959. There is a formal mound group at the Garagay site, and a strip of adobe relief decoration with a Chavín style design has been exposed in one of the mounds. The mounds are constructed of field stone, like the Huaca La Florida on the outskirts of Lima.

There is a large habitation site on the north side of the valley of Huarmey which was test pitted in 1958 by David H. Kelley. Kelley found 11 maize cobs but no evidence of pottery. He also found a chipped pebble disc of a type characteristic of preceramic sites of the Culebras culture. Paul Mangelsdorf saw the maize and concluded that most of it was like the maize from Huaca Prieta, but one ear could be something new. Mangelsdorf therefore arranged with Kelley to commission Duccio Bonavía in Lima to undertake further excavations at the site, called by Kelley Huarmey North 1. Bonavía worked there in January and February, 1960, digging seven pits in different parts of the site and carrying them to a depth of over a meter. Three sherds were found in one of the pits, none in any of the others or on the surface. The sherds were within the top 15 cm. of refuse. Maize was fairly abundant to the bottom of all Bonavía's pits. Bonavía collected over 40 cobs as well as some complete maize plants and abundant leaves, fragments of cloth, and matting. He found one dart point. The evidence suggests a late preceramic date for at least part of the deposit.

The Centro Nacional de Prehistoria, a new archaeological organization, was established by a presidential decree dated December 16, 1959. The Center is a semi-official organization which, however, is governed by a self-perpetuating board of directors made up of three tenure professors at the University of San Marcos and the Director of the Museo Nacional de Antropología y Arqueología. Frédéric Engel, who is a French archaeologist resident in Lima, has been appointed executive secretary of the new organization for a five-year term. The Center is specifically charged with coordinating the work of foreign archaeological expeditions working in Peru. That means, in effect, that requests for authorizations to excavate should, in the future, be submitted through the Center.

The Center plans to operate a laboratory and collection storage facility at Paracas, the buildings for which are now under construction, and will form a catalogue of archaeological sites. It hopes in the future to organize a program of training in archaeological research methods in collaboration with foreign institutes and universities. The Center has no government appropriation but is authorized to raise private funds. Engel expects to raise the first funds in Lima but hopes also to secure financial support from abroad. He feels that the new Center can be a great help to all who are interested in the development of Peruvian archaeology. Further information about the Center and its plans can be secured by writing to Frédéric Engel, Casilla Postal 330, Lima, Peru.

The text of the decree establishing the Center is reproduced, with a summary in English by J. H. Rowe, in a circular entitled *Government Regulation of Archaeology* in Peru which may be obtained from the Institute of Andean Studies, 2137 Rose Street, Berkeley 9, California.

CHILE. Joseph Emperaire and his wife, Annette Laming Emperaire, had been exploring archaeological sites in the Straits of Magellan area for several years when Emperaire was killed in a tragic accident late in 1958. He died an archaeologist's death; the side of a deep stratigraphic cut caved in on him while he was working alone in the bottom of the pit. Mme. Emperaire decided to continue the project, and Henry Reichlen was sent out from France to help her. At the end of the season Reichlen paid a visit to Lima and lectured at San Marcos on the work of the Emperaire expedition (June 22, 1959). The following notes are based on his lecture.

The Emperaires worked in the valley of the Río Chico, in Ponsonby, along the shores of the Straits of Magellan, and on Beagle Channel, following up the earlier work of Bird (1932–37). They made a cut in Fell's Cave parallel to Bird's in order to secure a new sample for comparison with other sites. They found essentially the same sequence that Bird reported, but Reichlen thinks it will be possible to use the new evidence to introduce some refinements in it. Some of the points from the first occupation level had been rubbed with red paint. In the second

level they found long points as well as the heavy, coarse implements reported by Bird. They took pollen samples and collected much evidence for the study of climatic changes in the region.

In Ponsonby the Emperaires dug a stratified site with a predominance of whale bone in the upper level and of guanaco in the lower. Emperaire believed that he could date the lower level to 4–5,000 B.C. on the basis of comparisons with the Fell's Cave sequence.

Shellmounds are very numerous along the Patagonian shore of the Straits of Magellan east of Punta Arenas, particularly at San Gregorio Bahía Posesión, and Cabo Dungeness. Most of these shellmounds have been badly eroded by the wind, resulting in a mixture of materials of different ages. In 1959 Mme. Emperaire and Reichlen made a cut in a shellmound at Bahía Munición which was in a protected location and not eroded. The cut was carried down to 7 m., penetrating seven levels of occupation separated by layers of sand. The oldest level is not yet dated. An eroded site at Cabo Dungeness yielded a mandible of a fossil camelid three times larger than the largest modern guanaco.

On the Tierra del Fuego side of the Straits there is a very large site at Punta Catalina and another in the Bahía Felipe on both sides of Cabo San Vicente. There are many sites also in the Bahía de Gente Grande. At the Punta Catalina site there are two levels of occupation. The earlier level has no shell in it and is characterized by thick, coarse implements like the ones in the second occupation level at Fell's Cave. The upper level contains marine shells and guanaco bones and many "knives" (stemless points?).

The lowest marine terrace on the Straits is at 2 m. There is usually a 6 m. terrace as well, but this higher terrace has few sites on it. On Beagle Channel the Emperaires found one site located over 40 m. above sea level in a place which is uninhabitable under present conditions.

Assembled by John H. Rowe

LOWLAND SOUTH AMERICA

Brazil. The Faculdade de Filosofia, Ciéncias e Letras de Rio Claro, supported by the state of São Paulo, has established a chair of Anthropology and Ethnology. Fernando Altenfelder Silva has been appointed to this position. He hopes to increase the archaeological emphasis and to add the word "Archaeology" to the title of the chair. Preliminary survey of the surrounding region has brought to light a number of sites of probable Guaraní origin and Silva expects to investigate several of them during 1960, with the aim of establishing their affiliations to the Guaraní sites he investigated earlier in the state of Paraná. Since this institution is a new one, library resources are slim. Reprints or copies of archaeological reports would be welcome. They should be sent to: Fernando Altenfelder Silva, Faculdade de Filosofia, Ciéncias e Letras de Rio Claro, Caixa Postal 178, Rio Claro, Est. de S. Paulo, Brazil.

In December, 1959, Peter Paul Hilbert of the Instituto Nacional de Pesquizas da Amazônia made a quick survey trip up the Rio Japurá as far as the Colombian border. He found sites sparse, with pottery resembling the incised and painted complex found on the Río Napo and along the middle Amazon. An earlier trip, in September, 1959, was made to the coast of Bragança, east of Belém. Several shell middens investigated in this area produced very crude shell-tempered pottery. A sample of shell was collected for possible radiocarbon analysis.

The Centro de Ensino e Pesquizas Arqueológicas of the Universidade do Paraná is continuing its archaeological teaching and research. It has recently commenced a publication series, the first number of which describes a nonceramic shell midden, the *sambaqui* José Vieira, the upper level of which shows Guaraní occupation.

Assembled by Betty J. Meggers

MIDDLE AMERICA

The Archaeological Institute of America at its meeting in December, 1959, elected Alfonso Caso, Director of the Instituto Nacional Indigenista of Mexico, to Honorary Membership in the Institute.

West Mexico. During January, a UCLA expedition conducted an archaeological reconnaissance along Mexico's west coast from the mouth of the Río Santiago in central Nayarit to the Jalisco-Colima border. This survey constituted the first season of Project A (Central and South Pacific Coast, Mexico), Interrelationships of New World Cultures Project, organized and sponsored by the Institute of Andean Research, Gordon Ekholm, Principal Investigator. C. W. Meighan and H. B. Nicholson are Project A's Principal Investigators. During the 1960 season, Nicholson supervised the survey and was present in the field for about two weeks; Jack Smith acted as graduate student field director and was assisted by Fran Smith, Robert MacLean, Herm Denitz, Thomas Blackburn, and Richard Watson. The area covered proved to be generally quite rich in small sites, many of which were apparently located for the first time. They are particularly numerous in the small river valleys along the southern Nayarit coast, the Valle de Banderas (Rio Ameca drainage, present Nayarit-Jalisco border), and the southern Jalisco coast, areas which, on the basis of the early Spanish entrada accounts, were well populated at the contact period (followed by an intense colonial depopulation). The highly developed painted ceramic tradition, so prominent at Amapa, on the Río Santiago flood plain, excavated last spring by another UCLA expedition, continues well down the Nayarit coast and into Jalisco. Small mounds are common at many of the sites, while petroglyphs on natural boulders, featuring various curvilinear and spiral motifs, are frequently encountered in the Nayarit region. The survey will be continued next year, moving further down the west coast, through Colima and Michoacán, into Guerrero.

CENTRAL MEXICO. During 1959, the Departamento de Monumentos Prehispánicos of the Instituto Nacional de Antropología undertook a number of works of restoration and consolidation at various sites, including Tula, Tulancingo, Castillo de Teayo, Tajín, Cempoala, Monte Albán, Yagul, Edzná, Zayil, and Chichén Itzá. Of special significance was the project at Tula, which involved the reinstallation on the top of Mound B of the colossal caryatids and carved square columns which once supported the roof of the sanctuary and the partial reconstruction of the columns of the adjoining colonnade. A number of archaeological investigations were also undertaken. At Culhuacán, stratigraphic cuts were made near the 16th century Franciscan convent, which is being restored by the Instituto. At El Trapiche, Veracruz, stratigraphic cuts were made and various Preclassic structures cleared. At La Venta, stratigraphic tests were made in the southern system of the principal ceremonial plaza, during which two new sculptures were discovered. At Balancanché, Yucatán, three natural caves were explored containing offerings dedicated to the rain god, coeval with Toltec Chichén Itzá. Minor investigations were also conducted at sites near Zapopan (Jalisco), Chintón de las Flores (Tamaulipas), Teopisca and San Cristóbal (Chiapas), and El Jobo (Veracruz). An important new project of excavation and reconstruction was initiated at Teotihuacán, under the general supervision of Ignacio Bernal, with Jorge Acosta in charge of field work. First operations during the winter of 1959–60 were directed to continuing the exploration of the structure inside the Pyramid of the Sun, begun during the summer of 1959 by a University of California party led by René Millon and James Bennyhoff, and to clearing along the bases of certain substructures south of the Pyramid of the Moon and fronting the Camino de los Muertos.

Richard S. MacNeish, National Museum of Canada, conducted a survey early in the year of the arid region of southern Puebla and northern Oaxaca, between Tehuacan and Huahuapan de León, investigating dry caves which might contain perishable plant remains and preceramic materials. Forty-four caves and rock shelters were inspected, five of which appear to warrant serious excavation. In the most promising cave, near Cozcatlán, Puebla, a 2 m. square pit was sunk to a depth of about a meter and a half; the upper two levels contained Classic materials, the third, Late Formative, and the five lowest levels a preceramic assemblage. A large quantity of plant remains and other perishables were recovered, including maize, beans, squash, gourds, cotton string, and barkcloth, in addition to various wild plants. The most important discovery was some primitive pod–pop maize cobs and warty squash associated with the preceramic lithic complex (scrapers, choppers, blades, knives, manos and metates, and so on). Further reconnaissance and excavation, planned for several seasons, with various specialists participating, promises to yield vital information concerning agricultural beginnings in the Mesoamerican heartland.

VERACRUZ-TABASCO. From January 16 to February 1, Robert F. Heizer and Howell Williams of the University of California, Berkeley, conducted a field reconnaissance in southern Veracruz and Tabasco in an attempt to locate the sources of the andesite used for the monuments of the Olmec–La Venta sites of Tres Zapotes, San Lorenzo, and La Venta. Although the precise locations of the quarries remain to be found, it was concluded after the investigation that only two areas could have served as sources, La Union volcano, south of Villahermosa, Tabasco, and the Tuxtla volcanic range of southern Veracruz. La Venta itself was visited and the monuments from that site and the others named which are in the anthropological museums in Mexico City, Jalapa, and Villahermosa were inspected, as well as the colossal head in Santiago Tuxtla. The source of the serpentines and schists discovered at La Venta, on the other hand, probably was the mountainous region between Tehuantepec and Tuxtla Gutiérrez, Chiapas.

OAXACA. From January 5 to March 15, eight Mexico City College students, led by Ignacio Bernal, who was called away almost immediately, and Charles Wicke, conducted further excavations at Yagul. Two more tombs were discovered in Patio No. 4, both belonging to the Monte Alban V period. Tomb 30, which contained polychrome ceramics related to the latest styles of the Mixteca, was distinguished by a particularly striking series of intricate *greca* motifs on the façade and the inner and outer walls, closely similar to those of Mitla. On the hill above the site, where the fortress is located, a complex of burial compartments formed by little rows of adobe bricks yielded some important burials with associated Monte Alban ceramics, including two outstanding, esthetically superior pieces: a face-effigy cylindrical brazier with strongly Olmecoid features, wearing a glyph-bearing helmet, and a tripod vessel with face-effigy supports. Sherd finds corroborated the clear presence of Monte Alban I at Yagul, which completes the continuity of occupation at this key Oaxacan site from Preclassic times to around the time of the Conquest (Monte Alban I–V). Some reconstruction work was also undertaken, on the face of a temple mound, and, particularly, on the ball court, excavation of which was completed this season.

LOWLAND MAYA REGION. Ninety-four gold objects recovered by Edward H. Thompson between 1904 and 1907 from the Sacred Cenote at Chichén Itzá have been returned by the Peabody Museum of Harvard University to Mexico. They were formally presented to Eusebio Dávalos Hurtado, Director of the Instituto Nacional de Antropología e Historia, by J. O. Brew, Director of the Peabody Museum. These objects, which have been illustrated and described in detail in a 1952 monograph by Samuel Lothrop, together with a number of other objects dredged up from the cenote by Thompson, have been the object of controversy between the Peabody Museum and the government of Mexico for many years. Although the latter's attempt to legally recover the jewels was frustrated in the 1930's by an adverse decision of the Mexican supreme court, hopes have always been entertained in Mexico for

their eventual return. Dávalos, in a radio interview, hailed this spontaneous donation as marking one of the most important events in recent Mexican archaeology as well as in the field of Mexican–United States cultural relations, stating that the offer was accepted by the Mexican government with the deepest appreciation of the gift and of the spirit in which it was made.

A. H. Anderson, Archaeological Commissioner, Colonial Secretary's Office, Belize, British Honduras, reports the following recent archaeological activities in that area. During the fall Anderson exposed the south end of an elaborate stucco molded frieze mounted on the roof of a buried building (A–6/2) at Xunantunich (Benque Viejo). This unusually well-preserved fine frieze had been previously partially exposed and reported upon by Linton Satterthwaite in 1950. Anderson also completed a new shelter built to protect it from the elements.

A nine-member expedition from Cambridge University, England, was engaged in various scientific investigations in British Honduras during the fall and winter of 1959–60. The archaeological division, composed of Euan Mackie and David Carr, collaborating with Anderson, also worked at Xunantunich, excavating the remains of a masonry building on A–11, locating another building buried beneath it, and excavating another masonry building on A–15 (abutting the east side of A–4). In the latter they discovered a bench burial. Buildings A–14, A–15, and A–16 were only found in recent years and therefore were not included in the Smith-Thompson site map published in 1940.

A number of limestone caves in the country contain important archaeological remains; many of these have long been known, but road development in recent years has opened up previously difficult-of-access areas and added substantially to the known number of these caves. Some appear to have been used for domestic purposes, others to have been put to religious uses. A series of four large, linked caves (beneath a substantial ruin) in the southwest Cayo District, known locally as "Las Cuevas" and containing sherds and architectural features, were partially investigated in 1957 by Anderson and Adrian Digby of the British Museum. A recently discovered cave of archaeological interest is Cubeta Cave, which contains numerous complex architectural features; working in this cave is extremely difficult, however, owing to the accumulation of carbon dioxide gas, which sometimes necessitates the use of oxygen equipment. In 1958, in the Río Frio area, Great Mt. Pine Ridge, Cayo District, Forest Department workers found two new caves (D, E) in the group which Gregory Mason explored and reported upon in 1928 (A, B, C, D). Cave E is of particular interest for the large quantities of sherds and some whole pots and other artifacts found in it. A radiocarbon test run on a sample of charred wood from a recess yielded a reading of A.D. 839 ± 150. In the same year another Forest Department worker found a very large cave ("Eduardo Quiroz") in the vicinity of Millionario Forest Camp, Cayo District, which is notable for having small passages which patently have been artificially enlarged, for many walled-up recesses and partition walls, and for the large size of certain shallow dishes found in it.

Anderson would like to have it known that the Government of British Honduras is anxious to have the many sites within the country explored and scientifically investigated, and to this end is prepared to be highly cooperative with bona fide archaeological expeditions. Holders of archaeological exploration permits from the Executive Council of the country are allowed to take home and retain up to 50% of their portable finds, the division being made by alternate choice by the government's representative and the permit holder. Approved expeditions are given practical help in many ways, including permission to import their equipment and stores free of customs duties. Anderson acts as liaison between the government and visiting archaeologists and is directed to afford them all the assistance within his power.

Further information has been received concerning the results of the first season's (February–May, 1959) excavations of the Willey-Smith Altar de Sacrificios project, briefly reported in Vol. 25, No. 2. The full reading of the most important of the four new stelae found (18–21), Stela 18, appears to be 9.9.5.0.0 9 Ahau 18 Uo (A.D. 618, GMT). This monument contains, in addition to a human figure, a hieroglyphic text of over 114 glyph blocks, about 50 percent of which, however, are so eroded as to be entirely illegible. In addition, two new Initial Series dates were discovered on previously known monuments: Stela 1: probably 9.11.10.0.0 11 Ahau 18 Chen (A.D. 662, GMT); Stela 15: probably 9.16.18.5.1 5 Imix 4 Xul (A.D. 769, GMT). Two new altars were also discovered, one plain and one carved. The former is one of the largest ever found in the Petén region, measuring 2.70 m. in diameter. A large number of the monuments at the site were tested for caches; one beneath Stela 16 yielded 49 obsidian fragments, while another beneath Altar 4 consisted of 13 eccentric flints, several of outstanding workmanship. A third cache was discovered eroding from the side of a structure: a large ceramic vessel containing over 600 flint flakes. At least two ball courts are apparently present, one of which was cross-trenched; it is of the Petén Classic, or open-ended type, with its two ranges and playing alley measuring about 30 m. in length. The ceramics so far recovered indicate an occupational span for the site from Late Formative through Late Classic times, with some evidence of at least slight extensions at both ends of this scale. As this note appears, the second season is well underway, and two more field seasons, plus a final year of laboratory study, are planned.

In January, two young American university students, John P. Milton and Gene Dursan, were led by the Lacandón, Bor, to a previously unreported ruin, which is now being called Yatoch Ku, located in the Selva Lacandona south of Lake Lacanhá, Chiapas. The site consists of a hilltop group of mounds on a large platform. The principal structure (Pyramid 1), which consists of a single vaulted rectangular chamber, is unique in that it displays remains of painted murals on the lower part of its four façades and the lower face of the intermediate moldings,

which separate the lower façade zone from the upper. From the little that remains it appears that the designs are not realistic but stylized and symbolic, although two realistic motifs, the humming bird and the flower and a water lily, are visible. The surviving colors are one or two red tones, green, and black. With the exception of one small red-painted figure, the smooth white plaster of the interior is completely devoid of decoration. Following the return of Milton and Dursan with the initial report, a second expedition was immediately organized, led by César Lizardi Ramos, of the Instituto Nacional de Antropología e Historia and the Centro de Investigaciones Antropológicas de México, who, with Milton, revisited the site for a short time. A large number of color and black-and-white photographs were taken, and a preliminary plan made of the ruin.

In the early part of 1959, George L. Cowgill, Harvard University, supported by a grant from the Henry L. and Grace Doherty Charitable Foundation, undertook an investigation of Postclassic sites and cultural remains in the Department of El Petén, Guatemala. A small stratigraphic excavation was made in the town of Flores, on Lake Petén Itzá, and surface collections were gathered from a number of sites in the vicinity of Flores. Ursula Cowgill, an agronomist, in addition to assisting her husband in his archaeological work, undertook a study of contemporary agriculture in the vicinity of Flores, a region in which the results of earlier similar studies in Yucatán are applicable only to a limited extent. This study was particularly concerned with yield amounts, causes of yield declines, and the length of time a milpa must be abandoned before it can again yield a good crop, basic factors which would determine the maximum population the region could have permanently supported in the past. Samples were also collected of lake sediments from a small lake near Flores and swamp sediments from the Bajo Santa Fé, near Tikal, which are being analyzed by various specialists for information concerning the prehistoric environment of the Petén. At the American Anthropological Association meetings in Mexico City in December, 1959, Cowgill presented a paper offering the thesis that the principal cause of the collapse of Petén Maya Classic civilization and the drastic Postclassic demographic decline in the region was failure of the water supply.

Highland Maya Region. S. W. Miles, Brandeis University, following up earlier work, conducted a survey of pre-Hispanic stone sculptural styles in the Pacific Coast and Slopes region of Guatemala during the summer of 1959. She is presently engaged in analyzing her data, with a view to working out a fairly detailed stylistic sequence in this region. Preliminary study has revealed an extremely close association between Izapa, near the Chiapas-Guatemala border, and Kaminaljuyú for at least one early period. Heath-Jones, who reported at the 1959 Society for American Archaeology meetings in Salt Lake City on the extremely important archaic-style hieroglyphic text on a broken stela found recently in a Miraflores context at Kaminaljuyú, is expanding her analysis and expects to publish her findings soon.

Wolfgang Haberland, of the Hamburgisches Museum für Völkerkunde und Vorgeschichte, reports that none of the Middle American students now or recently associated with this institution (Termer, Haberland, Zimmermann, and Barthel) are presently in the field, but that Franz Termer, in whose honor a Festschrift recently appeared in Germany, is preparing a new expedition to Guatemala for 1960.

Stephan F. Borhegyi of the Milwaukee Public Museum, with supplementary funds from the American Philosophical Society, and Lon Mericle of Milwaukee, did field work at Lake Amatitlán, Guatemala, in January. The following sites around the lake were surveyed, mapped, and photographed: Mejicanos (Site C), which appears to be an exclusively Early Classic center, Morloncito (Site A), and Yacht Club (Site B). Six underwater locations of prehistoric remains were investigated by expedition skin divers, led by Lon Mericle and aided by local divers. Materials dating from Preclassic to Late Classic, 208 specimens in all, were brought to light. Five thousand feet of movie film were taken of the underwater work.

Borhegyi, who directed the Guatemala survey, reports that local underwater work has been done at Lake Flores (Petén), which produced predominantly Late Classic finds, and Lake Ayarza (Santa Rosa), which had no indications of lake offerings. Lake Chicabal (Quetzaltenango) will be investigated by the same local group. The Milwaukee Public Museum group also worked in Lake Ixpaco (Santa Rosa), Lake Atescatempa (Jutiapa), and Lake Atitlán (Sololá) with negative results. Lake Guija (Jutiapa) has yielded materials to a local collector. Borhegyi suggests, very tentatively, that ceremonies with lake offerings may have been brought into the area, or intensified there, by the Pipil, since the majority of the material found is Classic.

Costa Rica. During the first three months of the current year, Michael Coe, University of Tennessee, conducted reconnaissance and excavations along the Guanacaste coast of Costa Rica, which constituted the first season of Project F, Interrelationships of New World Cultures project of the Institute of Andean Research. A large number of sites were located along this deeply indented coastline, reflecting the favorable ecological situation. Excavations, consisting of a total of 14 stratigraphic pits, were undertaken at the sites of Chahuite Escondido, near the base of the Santa Elena peninsula, and at Miramar, Huerta del Aguacate, and Matapalo, the last three in the zone of Tamarindo Bay, where 21 sites were located. A preliminary cultural sequence, based on shifts in ceramic types, has been set up for the Guanacaste coast on the basis of these findings. Four periods: Zoned Bichrome, and Early, Middle, and Late Polychrome, are recognized; the first probably equates chronologically with the latter part of the Mesoamerican and Peruvian Formative periods, the second with the Mesoamerican Early Classic and beginnings of the Late Classic, the third with the Late Classic and Early Postclassic, the fourth with the Late Postclassic. Four phases, Chombo, Santa

Elena, Doscientos, and La Cruz (A and B), have been worked out for the Santa Elena peninsula region, each falling in that order in each of the periods just named. For the Tamarindo Bay zone, three phases have been delimited: Monte Fresco, Matapalo, and Tamarindo, each similarly fitting in that order into the first three periods of Coe's general Guanacaste coastal sequence.

Assembled by H. B. Nicholson

NORTHEAST

Connecticut. Excavation programs are being conducted by chapters of the Archeological Society of Connecticut according to Bernard W. Powell, Editor of the society. Members of the New Haven Chapter have continued work at the Grannis Island site, off New Haven. Both Archaic and Woodland occupations have been reported from this site in past years and a cache of 20 large blades was recovered last season. Bone and charcoal fragments from a recently uncovered firepit are being retained in case a radiocarbon analysis becomes possible. The Bridgeport Chapter concluded its first season at the Eckart site on Lake Lillinonah. From an area 100 by 25 feet, over 250 classifiable artifacts were recovered. The majority of these are stemmed or side-notched projectile points. A nearby aboriginal quarry appears to be the source of the white quartz from which 80% of the specimens are made. Four hearths were uncovered, one associated with probable post molds. Initial surmises are that the site is an Archaic manifestation. The Albert Morgan Chapter continued work at the Phillips Rock Shelter near Glastonbury during the 1959 season. A large collection of pottery was obtained some of which represents new types in the area.

During the winter and spring of 1958–59, a group of students in the Department of Anthropology, Columbia University, under the field supervision of Jacques Bordaz, conducted a survey of the Mianus River Valley in Fairfield County between Cos Cob and the New York State line. The most extensive of their test excavations was in a rock shelter on the west bank of the Samuel Bargh reservoir. A small number of artifacts, including potsherds and projectile points were recovered. These are of culturally late types. The material is being studied at Columbia University and a report will be issued shortly.

Delaware. Bert Salwen, Research Associate in Archeology at Columbia University, conducted a survey for the Delaware Archeological Board on property recently acquired by the Hercules Powder Company, near Lewes. Previous excavations here by members of the Sussex Archaeological Association had located several shell- and refuse-filled pits. From these shell-tempered, fabric-impressed pottery and projectile points were recovered. Most of the projectile points were triangular suggesting a Late Prehistoric occupation.

Maryland. During 1959, writes William A. Tidwell, the Southwestern Chapter of the Archeological Society of Maryland has concentrated on three major projects. The first of these is a survey of Zekiah Swamp in southern Maryland. A large number of Archaic artifacts have been obtained through surface collecting. The second project has been the survey and preliminary excavation of the Beshers site, a large Archaic site and associated quartzite quarry, on the Potomac River about 20 miles northwest of Washington, D. C. One Clovis type point, several Gypsum Cave type points, and several hundred quartzite artifacts covering a wide range of Archaic types have been collected from the surface. A small number of rhyolite and white quartz projectile points were also collected. The third major project has been the excavation of the Winslow site. This Woodland site lies close to the Potomac River a few miles downstream from the Beshers site. About 1500 square feet have been excavated resulting in the discovery of 10 burials, three of which were infants. All were single inhumations, the adults being buried in oval pits in a flexed position without grave goods. A series of trash pits have yielded quantities of grit-tempered pottery with heavy "over-lapped" rims. Several hundred projectile points and other stone artifacts have been recovered along with a number of pipes and pipe fragments. Some of the pipes are simply trumpet shapes and others have an elbow at approximately 80°. Many of these latter have intricate punctate and incised designs. Bone material includes a fishhook and a number of awls. Charcoal samples were collected but have not yet been submitted for analysis. The Chapter plans to continue work on all three projects during 1960.

New Jersey. Charles W. Ward supervised a survey of Tocks Island and submitted a report to the National Park Service for the New Jersey State Museum.

New York. During the past three summers (1957–59), archaeological investigations have been carried out at Johnson Hall, built in 1763 and overlooking the City of Johnstown, under the direction of Paul R. Ducey, anthropologist at St. Lawrence University. The purpose has been to locate and identify as many of the former building sites as possible. The results of the first season included the location of a former tunnel which connected the Hall with the extant blockhouse, the excavation of a blacksmith shop, and the unearthing of a cobbled terrace. The 1958 excavations revealed a substantial portion of a stockade, built during Pontiac's Rebellion, and the superimposed foundations of two Colonial buildings. The more recent of these buildings may have been the "Indian Store," a trading post, or a combination workshop, storehouse, and office. The 1959 session made a more extensive, but incomplete, reconnaissance of the estate. Another section of the stockade was uncovered, but its precise dimensions have yet to be determined. Four building sites were excavated. One of these is definitely Colonial. It may have been the "Indian Store," a tailor shop, or Molly Brant's house. Another may be Colonial, but the evidence is inconclusive. The remaining two structures are 19th century. Finally, the original contour of the Johnson Hall site was established.

The artifacts recovered during the three field sessions include a surprisingly small quantity of Indian trade

goods (seed beads, quahog shell beads, vermillion, jews-harps, and so on); a substantial amount of Colonial material (china and pottery sherds, glassware, rum bottles, clay pipes, nails, hardware, utensils, oxen and horse shoes, and other items); and a great deal of 19th century kitchen debris. A representative amount of this material has been classified and dated by I. Noel Hume. The project is sponsored by the Division of Archives and History of the New York State Education Department, as part of a general restoration program.

The National Park Service, in cooperation with the Tactical Air Command, has obtained a series of aerial studies on color film showing the battlefield of Saratoga and other features within the park. They disclose the exact location of encampment areas no longer observable on the ground or identified with accuracy on extant maps. Edward McM. Larrabee has completed, under contract with the National Park Service, an archaeological survey of Saratoga National Park and explorations on the estate of General Schuyler at Schuylerville. On the grounds of the Schuyler mansion, which was burned by the British in 1778, several hitherto unknown buildings were located.

Julius Lopez of the New York City Archeological Group reports that the Pelham Boulder site, Bronx County, yielded three unusual traits for the local area and the northeast. Two have been announced in preliminary papers: (1) the discovery of different types of interior cordmarked pottery including decorated examples, narrow flat-bottomed basal fragments, and one instance of a mammiform appendage or knob; and (2) the discovery of some zoned curvilinear decorated sherds, one of which has a "modified Vinette I" interior.

While northern influences are no doubt responsible for the presence of Vinette I, the variations point to New Jersey where similar material occurs and further westward where mammiform lugs and flat bottoms occur on Adena pottery. The curvilinear decorations also point westward to vague Hopewellian influences through some Abbott pottery (Abbott Zoned Incised and Abbott Zoned Dentate) which the site also produced.

The third unusual trait, in the form of projectile points, also indicates a western derivation, specifically from the Delaware River Valley and more remotely from the Upper Ohio Valley. The points are predominantly of argillite which is found in the Delaware River Valley but not locally, not even in glacial debris. Typologically, many of the specimens in this "argillite complex" are similar to the wide-bladed Steubenville Stemmed and Steubenville Lanceolates from the Upper Ohio Valley. The resemblances extend even to the variations known for these two types and to basal flake scars, a highly hypothetical vestige of paleo-Indian flutings.

Lopez' research thus far discloses that Steubenville points (usually accompanied by other argillaceous points including Lamokoid and Laurentian-like types) are not uncommon in coastal New York. They usually occur in collections from Staten Island to eastern Long Island which contain one or more of the pottery types previously mentioned. Indeed, after having noted this mutual occurrence in some collections it was possible to successfully predict when Steubenvilles would be present in collections after examining only the site's pottery.

While the isolated and scattered surface finds in upper New York State might be earlier, there seems to be little doubt that the Steubenville points on the coast lasted into ceramic times, apparently into Middle Woodland. This does not necessarily contradict their possibly earlier status in the Upper Ohio Valley. An inspection of the Abbott Farm site materials discloses that argillaceous Steubenville forms were also present there. The coastal specimens probably mean that there was a time lag from the Upper Ohio Valley to the Delaware River Valley to the New York littoral with pottery having been picked up somewhere along the line with some Adena and Hopewellian traits.

On Staten Island, Albert Anderson and Donald Sainz have been instrumental in the formation of the Staten Island Archeological Society. It will operate under the aegis of the Staten Island Institute of Arts and Sciences. They have continued their weekend investigations of sites throughout the island. These include a stratified deposit near the old Bowmans Brook site and the Burial Ridge at Tottenville. The latter site is the subject of an M.A. essay by Jerome Jacobson of Columbia University. The essay reviews a century of archaeological work at the site. Jacobson reports for the first time on a 1920 summer field project of the Museum of the American Indian, Heye Foundation, directed by M. R. Harrington, as well as on previously unpublished local collections. It re-evaluates previous work by earlier investigators, including George H. Pepper and Alanson B. Skinner. The site has a pre-East River aspect component which has affinities with New Jersey. This is overlain by more typical Bowmans Brook and Clasons Point materials of coastal New York.

Under a New York State Museum and Science Service Honorarium, Donna Taylor, a Columbia University graduate student, is making a study of Iroquois wampum. One of the chief objects of the study is to determine, through the use of X-ray plates, frequencies of sizes and dimensions of the beads, and of their borings, to see if these have chronological significance. Both historically dated specimens and wampum found in archaeological contexts are being used. Mrs. Taylor would particularly like to hear about archaeological wampum; it is interesting that little or none has been found in Canada, written accounts on the Huron to the contrary.

PENNSYLVANIA. Within the National Park Service B. Bruce Powell and Jackson Moore have been working on reports of the archaeological investigation and laboratory research at Independence National Historical Park in Philadelphia.

Excavations by John Zakucia of Carnegie Museum at the Chambers site in Lawrence County which were stopped on November 20, 1959, were continued in the spring of 1960. Sufficient materials were found to establish the presence of an important historic Delaware village and associated cemetery with 70 burials. Evidence for earlier cultures was found in several areas of the site, the most

extensive of these being a Hopewellian component consisting of an earthen burial mound containing stone cist graves. The skeletal remains are being restored by W. C. Reeves and studied by Don W. Dragoo at Carnegie Museum.

Ontario. The Royal Ontario Museum participated in four major projects during the 1959 season. Two of these were extensive excavations; two were surveys.

Richard B. Johnston continued work at the Serpent Mounds under the auspices of the Royal Ontario Museum, with support from the Department of Lands and Forests, and the Serpent Mounds Foundation. In a summary of this work, Kenneth E. Kidd states that over half of the mound structure has been excavated. Fifty-four undisturbed burials were encountered in addition to a probably greater number of burials disturbed by more or less recent intrusions. A radiocarbon date obtained from material in the main mound by the University of Michigan laboratories indicates an age of 1830±200 year B.P. (in 1958). More samples are now available for further testing. Twenty-four burials were found in an ossuary-like pit north of the mound group, many of them disarticulated. They were accompanied by a broken stone adz and a few potsherds, some of Late Woodland types. A large part of the summer's work was devoted to the shellheaps near the mounds. Bone objects found in these include: awls, pins, a unilaterally and a bilaterally barbed harpoon. Projectile points and adzes also occurred. Most of the pottery was Middle Woodland in type, although a few Late Woodland and Iroquois sherds were found.

The second project was conducted by Walter Kenyon on the Miller site. An area of some 13,000 square feet was excavated in this village of the Glen Meyer focus (Late Woodland) located 15 miles east of Metropolitan Toronto. Four new graves were removed, over 2500 analizable rimsherds were collected, and one complete house outline and portions of several others were located. The burials are multiple secondary inhumations in randomly scattered shallow graves, both inside and outside the palisaded area.

The house outline consisted of a slightly flattened oval, 57 by 24 feet, with an opening at one end only. Down the center was a line of five hearths. Portions of other house floors which were uncovered suggest, by the degree of curvature, size, and the spacing of the post molds, that the excavated example is a typical dwelling of the Glen Meyer culture. Although none of the pottery has as yet been analyzed, it has many technical features, such as vessel shape, multiple incipient castellations, rim shape, decorative motifs, which are also present at the Uren site, an early Iroquois occupation in southern Ontario.

While it is still too early to present detailed evidence, Kenyon is of the opinion that a fairly complete developmental sequence beginning with Glen Meyer and carrying through to the historic period can be outlined. This sequence includes multiple secondary burials, multi-family dwellings, palisaded villages, agriculture, and ceramics.

Selwyn Dewdney spent his third summer recording pictographs in Ontario and Minnesota. His work was supported by the Quetico Foundation, the Royal Ontario Museum, and the Wilderness Research Center in Minnesota. It was actively assisted by the Department of Lands and Forests. Forty-two sites were visited and fully recorded. Most of them were in the Shield country, but a large and important site was on Lake Mazinaw in southern Ontario. More than 800 individual glyphs have been recorded at a total of 78 sites, several of which are in Minnesota.

The Royal Ontario Museum also continued for a brief period its work in the Rainy River District of Ontario. The aim of this project is to locate and map every mound in the area between Quetico Park and the Manitoba boundary. To date, 17 mounds have been mapped, the largest being 113 feet in diameter at the base, and 24 feet high. Both Laurel and Black Duck foci are present, the latter being most numerous. A deep subterranean burial chamber with a log roof was encountered beneath a low mound near the mouth of Rainy River last summer.

Assembled by Alfred K. Guthe

NORTHWEST

Oregon. Luther S. Cressman reports that the University of Oregon is now in its third season of field work in the area of the Columbia River, which will be flooded by the John Day reservoir. The program is being carried out in cooperation with the National Park Service. Both sides of the Columbia are under investigation. In previous seasons, field parties concentrated on the Boardman area, on the region near the John Day River confluence, and, in Washington, on the vicinity of the Rock Creek junction. In 1960, work is continuing on a site partially excavated in 1959, a house-pit cluster some miles up the John Day River, as well as at other sites east of the John Day and on the Washington shore. David L. Cole who has been supervisor of the program from the start is continuing in this capacity in the 1960 season.

Cressman announces the beginning of another important program. As part of the University of Oregon's interest in Pacific Northwest prehistory, work is being initiated on the Pacific Coast of Alaska. In 1960, explorations are being carried out on the Alaskan Peninsula, and in the following year systematic work will start on Kodiak Island. Eventually, it is hoped to resume investigations on the mainland. Future plans will depend on the results and promise of the first two seasons of work. This program is receiving valuable assistance from the Fish and Wildlife Service, Bureau of Commercial Fisheries, Alaska Region, U.S. Department of Interior. Don E. Dumond, a graduate student in the Department of Anthropology at the University of Oregon, is in charge of the work.

Idaho. The joint Idaho State College Museum — Peabody Museum of Harvard University expedition to Wilson Butte Cave is in operation for the second and final summer. Results from the first year's excavation, accord-

ing to Earl H. Swanson, Director of the Idaho State College Museum, produced a long stratigraphic sequence, and the second summer's operations are designed to expand information on the earliest horizons at this cave. The project is again under the field supervision of Ruth Gruhn.

Swanson further reports that the formation of a Department of Anthropology at Idaho State College has been approved, and plans are being developed for a degree program beginning September 1960. Some immediate appointments to the staff are planned.

WASHINGTON. Washington State University has three archaeological crews in the field this summer. This is the fourth and final season of excavation in the Ice Harbor reservoir on the Lower Snake River. Twenty-three students, enrolled in the annual summer field school in Archaeology under the direction of Richard Daugherty, are excavating a large burial site located on an island in the river. A crew of five, under the direction of Harvey Rice, a graduate student in Anthropology, is continuing work begun last year in a deeply stratified rockshelter.

To date, camp sites, house-pit village sites, burial sites, and rockshelters have been excavated in the course of this program, and it has been possible to establish a cultural sequence extending back approximately 7000 years.

A crew of ten from Washington State University is excavating in the Sun Lakes region of central Washington for the third and final season. Except for two open sites, all of the work has been concentrated on the excavation of a number of rockshelters.

Archaeological research at the University of Washington, according to Robert E. Greengo, has been continuing during the past autumn and winter, both in the laboratory and in the field. Analysis of Priest Rapids materials has revealed new insights into middle Columbia prehistory. A preliminary report on work done last summer in southwestern Washington was submitted to the Washington State Parks and Recreation Commission in December and a final report in April. Archaeological survey trips were made to various parts of the state, and new data were recorded along the Columbia and in the Willapa Bay regions. A report is in preparation on an important, previously unrecorded site on the Stillaguawish River north of Seattle. This site has yielded a lithic complex characterized by basalt implements ranging through leaf-shaped points, large, percussion-flaked blades, choppers, plano-convex scrapers and flake scrapers. Participants in the various projects directed by Greengo included Douglas Anderson, Ralph Emerson, Robert Kidd, Sonja Solland, and Margaret Susia. In addition, Robert Butler submitted an M.A. thesis dealing with an interpretation of the stratigraphy of Wakemap mound. In the current season, University of Washington field crews are again active along the middle Columbia and in southwestern Washington.

BRITISH COLUMBIA. Herbert Taylor of Western Washington College of Education will spend part of a year's leave of absence writing up the results of field work done in 1954 on the southeast coast of Vancouver Island under a grant from the Canadian Social Science Research Council.

This summer, a University of British Columbia field crew under the direction of Charles E. Borden is continuing excavations at the deeply stratified site in the Fraser Canyon north of Yale, where systematic work was begun in 1959. Objective of the current work is to obtain additional data on the various occupation levels that have been revealed so far and to investigate a possible early culture stratum some 25 feet below the present surface and 5 feet below a cultural horizon dated at 8150 years ± 310 B.P. Investigations at a nearby pit-house site are expected to yield information on the most recent phase of the long Fraser Canyon prehistory.

Large power dams are to be built on the Peace River and at various locations of the Columbia River basin of British Columbia. Unfortunately, very little information on these projects is available at present. Nevertheless, archaeological survey teams are operating this season in several of the most likely reservoir areas. These surveys are supported by funds which the University has received from H. R. MacMillan for archaeological research.

It appears that an event of great consequence to the archaeology of British Columbia is about to occur. At the opening meeting of the 1960 session of the Provincial Legislature it was announced that an Antiquity Act would be introduced. Details have not yet been made public, but, if the act will make adequate provision for salvage archaeology, it would mean the attainment of an objective toward which we have been working for many years.

Assembled by CHARLES E. BORDEN

SOUTHEAST

The salvage program on the Lower Chattahoochee is now in full progress. The University of Georgia, under a contract with the National Park Service, is continuing excavations at the large Mandeville Mound group for the second season. The University of Alabama has signed a contract with the National Park Service and will excavate on the right bank along with the Florida State University summer field session. The emphasis will be on the historic Lower Creek towns that thickly line the valley. Some time will also be spent on the Apalachicola Spanish Fort of the late 17th century. The Smithsonian Institution salvage crews under Harold A. Huscher are also in the basin for the second year. The University of Georgia is publishing the Oliver Basin Report by McMichael and McKeller. The sites in the Oliver Basin ran from a rather sparse Late Archaic up to Lamar grading into Ocmulgee Fields. The report should widen our knowledge of the relationship of Lamar and the historic Creek ceramics. David Chase of the Ft. Benning Museum has excavated test pits in the presumed Yuchi town which shows Lamar varieties of pottery plus an aberrant cord-roughened form that may be diagnostic of Yuchi in that area.

Ripley P. Bullen of the Florida State Museum completed a second season at the Palmer site near Osprey. The earlier component is an Archaic occupation running from preceramic up to Orange. Adequate shell samples for radiocarbon dating were obtained and submitted to the Humble Oil Company laboratory. The second component is a Weeden Island midden and burial mound that so far has produced 319 human and two dog burials. William H. Sears continued his Gulf Coastal Plain project with test pits at the Tucker site and mapping of the Aspalaga and Mitchell sites.

The Ft. Walton period Velda Mound was largely destroyed in January by a trench bulldozed across it in order to provide an afternoon's picnic entertainment. Such salvage as was possible was carried out by students at Florida State University. A profile cut along one side of the bulldozed trench showed at least three superimposed mound stages, each capped by red clay mantles. The first mound summit platform consisted of several bands of water-sorted sandy red clay. The temple was evidently daubed with clay, perhaps to the extent of being an earthlodge. The water-sorted layers resembled those at Mound C, Macon Plateau. Artifacts consisted of pottery (Lake Jackson Plain, incised and punctated, Ft. Walton Incised) and an hemispherical angled copper cone, perhaps of historic copper. This agrees with the situation at Hogtown Bayou where one Ishtucknee Blue glass bead was found with the presumably ceremonially shattered Ft. Walton vessels. It is also notable that the Ft. Walton Incised and Pensacola Incised pottery at Hogtown Bayou often had red or white paint rubbed into the incisions.

The City of Ft. Walton Beach has acquired the large Ft. Walton period mound in the downtown area. An extensive program of preservation of the mound and museum development is underway.

The Georgia Historical Commission, under the direction of Dan Morse, has conducted three major highway salvage excavations during the fall and winter. The Lingerfelt site near Dalton in northwest Georgia showed a complex occupation ranging from a Middle Archaic with lanceolate points, through Middle Swift Creek, to a late occupation with elements of Lamar and Mouse Creek phases. The Lilly site, Lowndes County, southeast Georgia also had a multiple occupation. Stalling's Island, Deptford, Middle Woodland, and a final sparse Mississippian phase were found. Several Spanish olive jar sherds indicate the inland penetration of early trade materials. Near Resaca in northwest Georgia, Morse was at work on a Williams focus site with Simple Stamped pottery which is clearly post-fabric impressed and earlier than Swift Creek. He found a deposit of corn cobs below a buried sod. This may be the earliest southeastern corn so far, although Morse had not yet completed either his excavation or analysis.

William G. Haag reports that he has completed his archaeological studies of southeastern coastal areas and that William McIntire will continue this work on the Texas and Laguna Madre coasts during the summer. Roger Saucier, Louisiana State University, is completing an archaeologic-geomorphological study of the Lake Ponchartrain Basin. He has secured a radiocarbon date from a Poverty Point site of 1200 B.C., while the numerous Tchefuncte sites in the basin seem to cluster around a date about 500 years later. The recently identified Elliot's Point complex in northwest Florida has been radiocarbon dated at 720 B.C. ± 100 years.

Stephen Williams continued excavation at the Lake George site during the summer with two major projects. A cross-sectioned mound showed an early Coles Creek complex not previously known to be present in that area. About 100 burials, all without grave goods, were found in this cut. A cut in the toe and excavations on the top of Mound A revealed a major temple on the next to top level.

A number of southeastern historic areas are becoming historic house museums and either have or will have archaeological research in connection with their development. The North Carolina Department of Archives and History is continuing excavations at Old Brunswick Town. Stanley South also began excavations at the David Caldwell "Log College" site near Greensboro. This was a frontier school of considerable regional fame which is now a state monument. Along with Town Creek and Old Brunswick Town this represents a continuing program of archaeological research and restoration in North Carolina. The St. Augustine Restoration Commission has begun historic and geographical research and hopes to begin limited archaeological research this summer. This will supplement and extend the combined archaeological, documentary, and architectural research carried on during 1958 and 1959 by the St. Augustine Historical Society. The Old State Capitol Museum at Jackson, Mississippi, will open in January, 1961, with Stewart Neitzel as curator. The museum is operated by the Department of Archives and History.

Assembled by CHARLES H. FAIRBANKS

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